THE PRACTITIONER.

JULY, 1884.

Original Communications.

ON HYPERPYREXIA.

BY HENRY F. A. GOODRIDGE, M.D., F.R.C.P.,
Senior Physician to the Bath Royal United Hospital.

THE Report of the Committee of the Clinical Society nominated "to investigate the causes, consequences, and treatment of hyperpyrexia,"[1] highly valuable as that Report must be admitted to be, leaves the first of the three points specified, viz. the causes of hyperpyrexia, comparatively untouched. The Committee assigned certain reasons for this omission, but seemed to intimate that they would later on resume their enquiry and present a further Report. Pending this very desirable event, and the completion by the Committee of their task, perhaps it may be permitted to an outsider to say a few words on the subject.

Is there not, then, some want of scientific accuracy in the way in which this term "hyperpyrexia" is currently used in the profession? It may be convenient enough to classify temperatures as sub- (or rather hypo-) pyrexial, pyrexial, and hyper-pyrexial; but the routine use of this nomenclature tends much to the fact being overlooked that high temperature may

[1] Clinical Society's *Transactions*, vol. xv.

be brought about by other conditions than pyrexia or fever. This, it may be unhesitatingly conceded, is the most frequent cause of elevation of temperature. But fever we know to be a complex pathological process, characterised by (α) an increased heat-production (Leyden), (β) a *relatively* diminished heat-discharge (Traube and Buss) while at the same time the latter is *absolutely* increased, and (γ) a disordered regulation of heat, so that this ceases to be for the normal degree of temperature and comes to be for an abnormally high one (Liebermeister). Indeed, notwithstanding that there are points still obscure in the mechanism of fever, I am not aware that anything better as a definition has been offered than Buss's,[1] viz. that fever is that pathological modification of the regulation of the heat of the body, in which with increased heat-production there is relatively diminished heat-discharge, whereby the temperature is elevated above the normal standard. To this, however, must be added, etiologically, that fever owes its origin to septic or other pyrogenic matters introduced into the blood. There can be no question here, then, that whenever the intensity of the febrile process reaches an extraordinary degree, and the temperature of the body an extraordinary height, the term hyperpyrexia is the proper one to use. But let us look at some other instances where, on account of elevation of body-temperature, pyrexia and hyperpyrexia are frequently said to occur.

Take, 1st, the thermal phenomena of tetanus. As the researches of Samuel teach, the chief source of the heat of the body is the musculature. When, therefore, the muscular tissue is in a state of inordinate activity or persistent tonic spasm, as in this disease, the heat-production should be increased. And clinical experience proclaims the fact. The heat-production is so great that the maximum heat-discharge is inadequate to meet the demand, and a marked rise of temperature ensues; indeed, until the muscles of respiration are involved and the oxidising processes are thereby interfered with, the temperature would seem to be in direct proportion to the violence of the muscular action. But here we have simply excessive production

[1] Ueber Wesen und Behandlung des Fiebers, von Dr. Carl Emil Buss. Stuttgart, 1878.

of heat. Immediately that by hydrate of chloral or other means the reflex excitability is subdued and the tetanic spasms allayed, the adjustment is made, and the temperature returns to the normal standard. The terms pyrexia and hyperpyrexia, it is submitted, are hardly strictly applicable here.

2nd. "Heat-stroke," or rather that variety of it which is designated "heat-fever." The one essential condition underlying the serious disturbances witnessed in this affection, as admitted by the best authorities, is arrested heat-discharge, or, in other words, heat-retention. It need not be said, the high temperature of the atmosphere, and in a direct ratio its humidity, hinders the normal discharge of heat from the body by radiation, conduction, and evaporation: the heat is retained and accumulates, and the temperature of the body rises in proportion. All successful treatment is, I believe, based upon this view. No doubt, unless the required abstraction of heat is speedily effected and the case relieved, tissue-changes ensue and other influences come into play, whereby a state of genuine fever is superinduced. Nevertheless that there is radically and in the early stage a distinct pathology here, I think, cannot fail to be recognised.

3rd. Conditions due to functional failure of that part of the central nervous system which regulates, if not the production of heat itself, at least those chemical processes upon which its production depends. To whatever extent the heat-regulation of the body may be assigned to reflex mechanisms which have their central elements in the spinal cord, clinical and pathological observations, to which may be added certain results of physiological experiment, have long pointed to the presence somewhere in or near the Pons Varolii of a supreme controlling centre. Not to cite further evidence, acute destructive lesions of the Pons, it is well known, are commonly attended with marked elevation of temperature.[1] Assuming, then, its existence, it would be contrary to all analogy if this centre or central mechanism were not liable to be put more or less *hors de combat* by depressing and exhausting influences. If its function were completely arrested, as in the instances just

[1] In a case of necrotic softening of the writer's not long since, the temperature ran up more than 5° in five hours.

referred to, the processes of oxidation in the body would so far have unrestricted play, and that condition to which the term hyperpyrexia is currently applied would be brought about—brought about by unrestrained production of heat. But clearly there may be minor degrees of disablement of this centre—a paretic condition only. An interesting illustration occurring in an anæmic subject has recently been published by my friend Dr. Withers Moore of Brighton.[1] Dr. Moore quotes from a note on the case written to him by Dr. Burdon Sanderson in which the latter says: "The temperature is higher, not because oxidation is taking place at a greater rate, or heat produced at a greater rate, but simply because oxidation and heat-production go on notwithstanding that the increased temperature of the body ought to have, so to speak, shut the safety-valves." The "automatic check-action," as Dr. Sanderson elsewhere calls it, or (what I take to be the same thing) the functional energy of the regulating mechanism, being impaired, the temperature of the body rises. And have we not here the elucidation, if not the complete explanation, of more than one obscure *quasi*-febrile state?

But to proceed. In fever the regulation of heat is not annulled. The fever-patient regulates his heat nearly as efficiently as a healthy person does, only for a higher temperature. The cold-bath treatment of typhoid fever strikingly illustrates this fact. We know the resiliency of the body-heat to be so great in these cases that after it has been brought down, perhaps to the normal, we have to return to the charge again and again and repeat bath after bath, at longer or shorter intervals according to the intensity of the fever, until at length the regulation force is overpowered.

These several conditions, then, excessive heat-production, arrested heat-discharge, and deficient heat-regulation, all having for result elevation of temperature in common with fever, and tending more or less to develop into it, I submit are yet distinct from it; and if, for convenience' sake, the nomenclature of fever be applied to them, and they be regarded as in a sense its clinical allies, it should be remembered at any rate that they are not its pathological equivalents.

[1] *British Medical Journal*, 1884, vol. i. p. 258.

The skin being the chief channel for the heat-discharge of the body, the importance of paying due attention to its condition in the treatment of fever is obvious. But if in any particular form of fever, and as part of its natural history, the skin be found to be specially active, and the amount of its secretion to be largely increased, clearly the importance of such attention would be still greater, since whatever tended in any way to suppress that secretion or to check its free escape by evaporation, might be expected to add in the same proportion to the febrile heat, and to intensify the febrile condition, and to do this independently of any toxic effects which possibly the retention of excretory matters might at the same time produce. In this consideration have we not a clue to the origin of hyperpyrexia in rheumatic fever, that is, in certain cases? What determines the remarkable activity of the sweat-glands observed in this disease is not yet ascertained; but in any given case it can hardly admit of doubt that, whatever the temperature of the patient for the time being may be, except for this copious perspiration the temperature would at once be higher. It is just so much natural and spontaneous heat-discharge, and the true indication assuredly is to favour and facilitate it and to assist cutaneous transpiration.[1] But how often has just an opposite course been pursued! The patient, from an exaggerated dread of chill and the painfulness of all movement, has been allowed to remain for days together under an impervious load of blankets and counterpane, enveloped in flannel, his skin uncleansed, the immediate environment of his body stagnant as well as fœtid, and with by and by a copious miliary eruption testifying to the folly perpetrated. In the emphatic language of Dr. Sydney Ringer[2] (to whom we are indebted for the first record of cases of hyperpyrexia), "these woollen clothes are worn day after day, till, saturated with putrefying perspiration, the stench sickens and de-appetises the patient, and a crop of irritating miliary vesicles is engendered which breaks the patient's sleep."

To such mismanagement, which albeit found some countenance in certain clinical teaching of the day, not a few of the

[1] "Address in Medicine," *British Medical Association*, 1878.

[2] *Handbook of Therapeutics*, by Sydney Ringer, M.D., 9th edit. p. 57.

cases of rheumatic hyperpyrexia, I venture to think, have been mainly attributable, and I will illustrate my meaning by a case :—

J. M., æt. 28, French polisher, was admitted into hospital *August 17th*, 1866, on the tenth day of an attack of acute polyarthritic rheumatism. He had had much attendant perspiration, and on August 12th began to experience a sense of tightness at the mid-sternal region with palpitation. He had had a similar attack four years before. *On admission*, both his ankles and his right great toe were red, swollen, and tender; and more or less so his knees, wrists, and elbows; pericardial friction-sound was heard over the base, and a systolic murmur at the apex, of the heart; he had complete anorexia; and his sleep had been much disturbed. To have pot. bicarb. gr. xx.+ pot. nitr. gr. xv., ex aq. menth. pip. every four hours, and pulv. ipecac. co. gr. x. at bed-time. He was at once enveloped in flannel and blankets, &c., *more solito*, and had cotton-wool applied to his painful joints and to his præcordia. Beef-tea, milk, and arrowroot for diet.

August 18th.—He had had an indifferent night. *At visit*, pulse 132, respirations 28, temperature in axilla 104°·2. Miliary eruption was present over his chest and abdomen; his bowels were open; his urine was free from albumen. To have six leeches applied to the præcordia, to continue the alkaline draught, and to have opii gr. j. night and morning. *At 9 p.m.* pulse 120, respirations 24, temperature 104°; his face was bedewed with perspiration; his præcordial uneasiness was relieved by the leeches.

August 19th.—He had had a good night; had pain now only on movement; pulse 120, respirations 24, temperature 103°·2; his tongue was thickly coated; he had much thirst. *At 9 p.m.* pulse 120, respirations 32, temperature 104°·8; there was marked friction-sound over the whole of the præcordial region.

August 20th.—He had slept only two hours. At 9 *a.m.* pulse 116, respirations 32, temperature 105°; he was bedewed with perspiration; he had pain in his arms and legs on movement. 2 *p.m.* pulse 120, respirations 36, témperature 106°·4; his tongue was coated and dryish, his bowels were confined; his urine was still acid. There was some coarse crepitation over bases of both

lungs, with slight dulness of right. Half an ounce of brandy was now ordered to be given him every hour. 6 *p.m.* pulse 160, respirations 40, temperature 108°·8. The patient shortly afterwards lapsed into a state of coma with convulsions, and died at 7·30, this being the thirteenth day of his attack.—*Necropsy* 20 hours p.m. The pericardium contained four or five ounces of serous effusion, and its cardiac surface was extensively roughened with plastic deposit, not entirely of recent date. The heart was of about the normal size; its muscular texture was somewhat pale, and under the microscope the fibre showed incipient fatty degeneration. There was no distinct valvular disease, but the endocardium near the attachment of both the aortic and mitral valves was deeply stained with the colouring matter of the blood ; the aorta also for about an inch above the valves was similarly stained. The lungs, otherwise healthy, were both greatly congested, particularly at their bases. The liver appeared fairly healthy. The kidneys were congested. The head was not examined.

The hyperpyrexia in this case would seem to correspond to Type A in the classification of the Committee of the Clinical Society, and thus characterised:[1] "Temperature rising gradually for a few days, and then suddenly culminating in a maximum by an exacerbation of several degrees." In the management of the case the system before described was adopted; it was at that period in vogue, just as it was for years after. In 1869 I recorded[2] an instance of Trousseau's "cerebral rheumatism" in which the patient, a girl æt. 15, was for eighty hours, commencing on the thirteenth day of her rheumatic attack, in a well-marked and continuous delirium, and whose temperature in the course of it reached 105°·6. She was similarly managed, and had abundant miliary eruption. I resolved upon trying a warm bath (102°), and repeated it; and the result was so satisfactory as to convince me that the flannel-pack system was a great mistake. Further experience served only to confirm this conviction. I have ever since made it a rule to pay particular attention to the skin of my rheumatic-fever patients, never allowing any excess of clothing, and

[1] Report.

[2] *British Medical Journal*, 1869, vol. i. p. 324.

insisting upon morning and evening sponging of the body with warm water by a trained nurse. Proceeding thus I have not again encountered hyperpyrexia of this kind, and only once or twice any threatening of its approach. A relatively-diminished heat-discharge, we were reminded at the outset, is an essential element of pyrexia or fever; but in such cases as have been referred to, this would seem to be still further diminished by the natural efforts to increase it being defeated through the mismanagement of the patient. In regard to the condition of the skin in this affection the Committee report:[1]—"The notes before us give no information as to the cutaneous condition during the continuance of hyperpyrexia in fourteen out of the sixty-seven cases. Of the remainder sweating is noted in forty cases, with sudamina in twenty-two; in one case the skin is noted as 'moist,' and in only twelve is it distinctly stated to be dry. These results are not therefore in accordance with the general impression that a dry unperspiring skin is an invariable concomitant of rheumatic hyperpyrexia; such a condition of skin being present in not much more than one-fourth of the cases." I submit, however, in reference to the causal relationship above suggested, that it is not of so much moment what the state of the skin is during the continuance of the hyperpyrexia, as what it was prior to the onset of the same. Again, if even at this antecedent stage the skin were moist and sweating (as in fact it was in the case that has been given, and under such circumstances can hardly fail to be more or less), it would by no means follow that the proper heat-discharge was being effected. To this end it is necessary that the rate of evaporation be in due proportion to the amount of secretion, and with the flannel pack, &c. damming up the perspiration, that is impossible.

The Committee found that during the decade with which their Report deals, there was a great prevalence of rheumatic hyperpyrexia in the four years[2] 1873 to 1876. They noted a great reduction in the number of cases subsequently, and suggest that the introduction of salicylate of sodium as a remedy may more or less account for this, adding, however, that rheumatic hyperpyrexia was apparently as infrequent prior to

[1] *Opus cit.* [2] *Opus cit.*

1873. Whether in this earlier period cases were *really* as rare as they appeared to be may perhaps be doubted; none had been recorded before Dr. Ringer's in 1867, and the condition was not generally recognised. But of the recent infrequency there would seem to be no doubt at all. Very few cases came under the personal notice of the Committee at a time when they were in search of them for the purposes of their Report, and only few have been published of late years in the medical journals. I cannot but trace then, in this fact, the beneficial effect of a more rational management of the patient, which I believe has now pretty generally superseded the old method; at the same time I should be far from ignoring the influence of the salicylate treatment, which in my individual experience has proved of great value.

But there is more than one kind of hyperpyrexia, or rather it should be said, hyperpyrexia can be brought about in more than one way; and so indeed the complex mechanism of pyrexia itself might lead us to expect. The Committee's Type B is thus described:[1] "Temperature, after maintaining for one or more days a moderate level, suddenly rises to excessive heights;" or, in the terms they use elsewhere in the Report, "a rapid rise from a comparatively mild and moderate pyrexia." Perhaps the following case may serve as an example:—

Mr. R., æt. 19, was recovering from an attack of acute rheumatism, and was sent to Bath for the use of the mineral waters to promote his convalescence. It was his second attack, the first having been two years previously. He was a tall, spare, and somewhat pale young man, had been growing rapidly of late, and had been reading for an examination. He had used the waters pretty regularly for nearly a month, and seemed to be doing well—he was expecting, indeed, to return home in a few days' time—when a recurrence of rheumatic arthritis began to show itself in his knees and ankles, and about the same time he developed symptoms of chorea. Treatment with salicylate of sodium had brought some relief to the rheumatic affection, but the chorea remained much the same. At the request of Mr. Biddulph Goss, who was attending, I saw the patient with

[1] *Opus cit.*

him on *February* 1st. He exhibited marked choreic agitation, with contortion of the features and difficulty of articulation; there was some swelling and tenderness of the left wrist, but the knees and ankles were now pretty free; his temperature was 101°; his pulse was 110; he had a faint, but distinct, systolic murmur at the apex of the heart; blue litmus-paper placed under his tongue was reddened; his bowels were rather confined; his urine showed nothing much amiss. He was ordered to keep his bed, to be sponged over daily, to have enough blankets for his comfort and no more, and to have cotton-wool applied to his wrist. A saline aperient with rhubarb was prescribed to be taken immediately, and the following draught every six hours:—℞. pot. citr. ʒss. + liq. pot. arsen.: ♏ iv. + syr. aurant. ʒss. + aq. dest. ad ℥i.—M. His diet to consist of milk and farinacea.

Except that his nights were more or less restless, he went on fairly well until *February* 6*th*, when there was an increase of arthritis, and his temperature rose to 103°; the same night he complained of pain in the left mammary region. I saw him again with Mr. Goss on *February* 7*th*. Both wrists were now affected; the pain in the left side had been relieved by a poultice; his pulse was 140, his respirations were 36, his temperature was 103°·4; his skin was slightly moist with perspiration, which reddened blue litmus; he was tender on pressure at the lower end of the sternum, the systolic apex murmur was very distinct, but no pericarditic friction-sound could be detected, nor any pleuritic friction, and the air seemed to enter his lungs everywhere freely; his tongue jerked out was moderately clean; he had taken his food fairly well; his bowels were open. The choreic agitation was still considerable. He was ordered to have at bed-time pulv. ipecac. co. gr. x. +, pot. nitr. gr. xv., and to repeat the powder three hours after if necessary, also a belladonna plaster to be applied to the cardiac region. To have a hospital nurse and to be sponged twice daily.

February 8*th*.—After a second powder he got three hours' continuous sleep, and some short naps subsequently. The belladonna plaster, he said, had greatly relieved his chest pain. The draught was now omitted, and sodii salicylati, gr. xv. ex. aq. cinnam. ℥i., were ordered to be taken every three hours.

February 9th.—He woke up in the night in great excitement, took the nurse to be a stranger, and would get out of bed. She was obliged to have assistance. From that time forth he was occasionally delirious. I saw him with Mr. Goss at 11 *a.m.* The patient had taken grs. 120 of salicylate of sodium during the preceding twenty-four hours; he had, however, neither deafness nor tinnitus, while the urine passed showed readily the reaction to perchloride of iron. He had no pain now except in his shoulders; his pulse was 140, his temperature was 102°·6; there was no pericardial friction-sound; he had no miliary eruption; he had taken his food well; his bowels were open. There continued a tendency to delirium and to getting out of bed. He was ordered to have ammon. carb. gr. iv. and liq. opii. sedativ. ♏ v. added to the draught, and to have increased a small allowance of whisky which he had had per diem lately. He remained quiet until *about* 3 *p.m.*, when his mother, who had been summoned, arrived from the Isle of Wight, where the family resided. He was much pleased to see her. *At* 6.30 he became very delirious, and *about* 7 convulsions came on and continued *till* 8; they then ceased, and the patient sunk into profound coma. *At* 8.30 his temperature in the axilla observed by Mr. Goss (who was unable to see him before) was 110°, and *at* 9 he died. There was no post-mortem examination.

Thus within the space of nine hours (and very possibly less) the temperature of this patient rose from 102°·6 to 110°, an abrupt transition from a moderate pyrexia to an extreme hyperpyrexia, as compared with the gradual development day by day of the latter in the case before considered. Again, that manifest obstruction to the heat-discharge by the skin, which there is reason to believe was so largely concerned in the production of hyperpyrexia in the former case, was completely absent here; the skin had every attention paid to it with a view to assist the natural heat-discharge. And again, there was a symptom of exhaustion present in this case which was not observed in the other, viz. delirium,[1] and it preceded the onset

[1] It may be thought that the delirium here was due to "salicylism," but the absence of the commoner physiological effects, coupled with the fact that the patient had taken salicylate of sodium on previous occasions in larger quantity

of the hyperpyrexia by some ten or twelve hours. There being, then, apparently no special heat-retention in operation, nor any special increase of heat-production, except perhaps a little due to the convulsions (themselves but incidents of the hyperpyrexial state), we are led to look to failure of the regulation of heat as the proximate cause. We have seen that this is attended with rise of temperature of the body in the non-febrile state, and that the regulation of heat in fever is not annulled, but only modified, being set at a higher degree of temperature. Besides the symptom just mentioned, several circumstances in the history of the foregoing case suggest and betoken exhaustion, especially the complication of chorea; and in rheumatic fever generally, in which hyperpyrexia is more prone to occur than in any other febrile disease, in addition to the deficient sleep and prostrating influences which appertain more or less to all fever, there is the intense wearing pain of the joints affected, and but too frequently also the cardiac distress, all contributing to exhaust the powers of the patient. Let now this exhaustion only reach the nervous centre which presides over the regulation of heat of the body, and at once its function fails, the "automatic check-action" is impaired, and the oxidation and heat-production processes are in the same proportion "let go." But in fever, and as an essential element of it, the production of heat is increased; oxidation, we know, proceeds at a greater rate than in the non-febrile state, hence failure of regulation in it would mean an already excessive heat-production set free from restraint. Are we not, then, justified in attributing to arrest of the regulation of heat those cases of rheumatic hyperpyrexia in which the rise of temperature is sudden and extreme, cases of Type B of the Committee? Nay, may not this ultimately have a share in the result in other types, as *e.g.* in determining the final exacerbation in Type A? And does not it afford the best explanation of the so-called "proagonal" cases? Assuming the correctness of the view here taken, it is clear that in cases of the kind successfully treated by cold baths something more is done than the mere abstraction of heat; the energy of the

without delirium, seemed to render this supposition inadmissible. The writer has more than once known delirium come on in a patient taking this drug which yet proved to be not due to it.

heat-regulating centre must be restored. It is to be regretted, I think, that in the Committee's Report, in twenty-five cases of recovery under the external application of cold, in nineteen of which various drugs (quinine, salicylate of sodium, aconite, digitalis, &c.) were severally combined in the treatment, no mention is made of the use of alcoholic stimulants. It is hardly to be supposed that they were not given at all, but if given in anything like such quantities as in Dr. Wilson Fox's famous cases, their antipyretic property must surely count for something.

The cases that have been considered would represent hyperpyrexia as originating from one of those conditions capable of elevating the temperature of the body *per se* being superadded to the pre-existing fever, retention of heat in the one case, failure of regulation of heat in the other. But hyperpyrexia, although in this instance it may not attain to the highest levels, may undoubtedly ensue from sheer intensity of the febrile process itself, and then probably excessive production of heat, dependent upon unwonted abundance or virulence of the pyrogenic agent, would be the chief factor concerned. Perhaps Type C of the Committee is the one most suggestive of this origin: "The pyrexia has a more continuous course, not unlike that of typhoid fever, without violent and excessive exacerbations." The Committee specify two other types, D and E, in which response to treatment with cold baths is made a ground of distinction. They have also a small residuum of cases not referable to any of these types. Moreover hyperpyrexia is known to be an occasional event in other acute febrile diseases than rheumatic fever. The subject is a wide as well as a most important one, and, mindful of the able hands entrusted with its investigation, I would, in conclusion, express the hope that due deference has not been wanting in anything I have ventured to say thereon.

ON
THE TREATMENT OF EPILEPTIFORM NEURALGIA, OR THE SO-CALLED INCURABLE FACIAL TIC.

BY W. J. WALSHAM, F.R.C.S.,

Assistant Surgeon to, and Surgeon in charge of the Orthopædic Department at, St. Bartholomew's Hospital.

"ALTHOUGH," says Trousseau,[1] "epileptiform neuralgia from its nature must be considered as an almost incurable affection, I have always felt it a duty to combat it by therapeutic means. . . . . . Of all the therapeutic agents that I have tried, and I have tried a great number with the utmost perseverance, opium is the one that has given me the least disappointment. But remember this, gentlemen, that opium in the treatment of epileptiform neuralgia must be given in large doses." And in large doses indeed did Trousseau give it—ten, twenty, or even thirty grains daily were in some cases found barely sufficient to relieve the pain; one patient took as much as four hundred grains a day, and spent 1,200 francs during one year alone in the purchase of the drug. Here is a choice of evils! Either to bear, as best one may, the agony of this terrible malady, or to be reduced to the pitiable condition of an opium or morphia *habitué*.

Since Trousseau published his admirable but discouraging lecture on epileptiform neuralgia a new field for the relief of pain has been opened to us; and nerve-stretching, if it cannot cure the affection, can give the sufferer the prospect of months or years of immunity from it.

During the last few years I have had a series of six cases of

[1] *Clinique Médicale de l'Hôtel-Dieu de Paris*, Paris, 1868, pp. 155–161.

this interesting form of neuralgia under my care, but it is not my intention to relate them in detail, as, although in none of them has there as yet been any return of the pain, I do not wish to publish them until a sufficient time has elapsed to show whether the, at present, apparent cure proves permanent. It is merely desired here to call attention to a method of treatment which, although it may not permanently cure, has at any rate already given to these patients many months and, to some, years of freedom from their suffering.

As the disease is a somewhat rare one, it may be well, before passing to the treatment, to say a few words on the symptoms. The terms epileptiform neuralgia and incurable tic are, to say the least, unfortunate ones, inasmuch as the former implies that the affection is a form of epilepsy, which it is not, and the latter that it is incurable, which I think cannot now be affirmed of it. The terms, however, are here retained as those by which it is best known.

The disease is characterised by neuralgic paroxysms occurring in one or more branches of the fifth nerve, and is always, as far as I know, confined to one side only of the face. The pain as a rule is not constant, or, if so, is increased during the characteristic paroxysms. These seldom last more than half a minute at a time. In one of my patients they were said to last half an hour; but they seemed to be rather a series of paroxysms following in quick succession than a single prolonged one. The pain almost invariably begins at one spot, that is, in one branch of the nerve, thence centrally spreads along that branch, and is radiated to the other branches of that division; or it may be transmitted to a second or even to a third division of the fifth. A paroxysm may be determined by very various causes—speaking, eating, washing the face, a draught of cold air, a sudden noise, pressure on a certain spot, a fly settling on the beard—in short, anything even of the most trifling nature. During a paroxysm the action of the patient is characteristic. He rubs the part violently, or grasps his head between his hands, stamps upon the floor, or paces hurriedly about the room, convulsively clutches at anything within his grasp, or throws himself upon his couch or bed and writhes in agony. The pain is variously described by the patients as

agonising, "like a bundle of red-hot wires being driven into the face, and then twisted in all directions," "like the seizing of all the teeth at once with dental forceps and rocking them to and fro," "like crushing the part in a vice," or "stabbing it in a thousand places at once with bradawls or sharp needles." A paroxysm comes on whilst the patient is describing his symptoms. He breaks off in the middle of a sentence or even a word, to undergo his torture; the muscles of his face may visibly twitch, his conjunctivæ become suffused, a tear perhaps trickles over his cheek. Suddenly the attack ceases, and with a sigh of relief he resumes the history of his sufferings. A second paroxysm may not occur for half an hour, even though the irritation which produced the first is repeated; but more frequently there will be two or three during the next ten minutes. The number of paroxysms during the twenty-four hours varies greatly; they may occur during the day only, but more frequently during both night and day. Sometimes there may not be more than twenty or thirty in the twenty-four hours; at other times there may be two or three or even more every half-hour. They vary at different times in the year and are usually worse in the spring. When severe, they make the patient's life almost unbearable, preventing sleep and rendering the taking of food, which invariably brings them on, a dreaded evil.

The treatment may be divided into the Medical and Surgical. Of the former little need be said. Nearly every drug in the Pharmacopœia has, at one time or another, been tried with but little success. Opium in large doses, as given by Trousseau, undoubtedly relieves the pain for a time; but little permanent benefit can be expected from it, and the remedy, if remedy it can be called, would appear almost worse than the disease. Aconitia, given internally, has been strongly advised by Gubler as a specific. I tried it in two cases but was disappointed. In one patient, the pulse under its use became intermittent every third beat, and it had to be relinquished after a few doses. In neither was any benefit apparent. Among the surgical measures may be mentioned neurotomy or division of the nerve, neurectomy or cutting a piece out of the nerve, nerve-stretching, removal of one of the ganglia connected

with the fifth, the application of the actual cautery, the introduction of hot needles into the supra-orbital, infra-orbital, or mental canal. Of the last-mentioned method of treatment I have had no practical experience, and the accounts I have heard of it are not encouraging. The actual cautery was employed in one of the cases before it came under my care, and seemed to give some relief for a few hours after each application, but no more. That merely temporary benefit is obtained by division of the nerve is well known; and even after a piece has been cut out the pain has soon returned. In three of my patients one or other of these operations on several occasions had been previously performed, but with the most evanescent relief, the pain returning as severe as before in a few days. Nerve-stretching on the other hand has been attended with the most happy results. In the first patient with this disease who came under my care I stretched the infra-orbital nerve; the neuralgia was of ten years' duration, and for two years of this time the patient had been actually bedridden, as the pain was beyond endurance when she attempted to get up. All medical remedies had been tried and failed. The operation was performed in February, 1879. She was completely relieved, and when last heard of three years afterwards by my friend Mr. Anderson, who sent her to me, she expressed herself as having been cured. The second patient, a man thirty-two years old, who had been an out-patient of Dr. Lauder Brunton's, had had the neuralgia for nine years. He had formerly been in good circumstances, but in consequence of his pain had been rendered unfit for any mental exertion and had gradually lost his business. The neuralgia was confined to the regions supplied by the auriculo-temporal and inferior dental nerves. He had consulted many of the most eminent physicians in London and Paris, and various homœopaths, medical rubbers, and electricians, and had had the inferior dental and mental nerves divided by Messrs. Tomes and Durham. In April, 1883, I stretched the auriculo-temporal nerve, and a week later the inferior dental from within the mouth. The relief from pain was complete; he has had none since, and is now again making headway in his business. The third patient, sixty years old, had suffered for eight years. The pain was confined principally to the inferior dental nerve. I stretched this in May, 1883. Since then he

has had no pain except some slight twinges in the infra-orbital nerve (none in the inferior dental) for a few days in March, 1884, ten months subsequent to the operation, after having got wet through and taken a violent cold whilst following his occupation as a gardener. The fourth patient, a man fifty-six years old, had been in St. Bartholomew's Hospital for some time under the care of Dr. Church, and more lately as an out-patient under Dr. Lauder Brunton, to whom I was indebted for the case. He had suffered for five years. In November, 1883, I stretched the inferior dental and infra-orbital nerves, and he has remained well since. The fifth, a man seventy-three years old, had suffered for ten years with pain chiefly in the inferior dental. He had had the mental branch cut and stretched with little or no benefit at the National Hospital for Epilepsy. In March, 1884, I stretched the inferior dental from within the mouth; the patient, notwithstanding his age, had no bad symptom, and at present has had no return of his neuralgia.

In the sixth case a man, fifty-nine years old, had suffered for upwards of fourteen years. He had been under the care of several physicians, and had had the supra-orbital and infra-orbital stretched on various occasions. Looking to the success of the above cases I attempted to stretch these nerves again, but found, on cutting down upon them, that the tissues were so matted together, as the result of the previous operations, that it was impossible to isolate them. An aneurysm needle was passed under the cicatricial tissue in the situation of the nerves, and an endeavour made to stretch it, but it did not yield to any appreciable extent. The pain was as severe after the operation as ever. On more closely questioning him it was found that although he said the pain began in the cheek and darted upwards over the head, it really began in the gums in the region of the molar teeth, which had been previously extracted, *i.e.* in the posterior dental nerves, and shot upwards towards the back of the orbit. In January, 1883, I removed Meckel's ganglion and the whole of the superior maxillary nerve, after having forcibly stretched its proximal end, from the foramen rotundum to the spot where it emerges on the cheek. The patient had no bad symptom; he slept well the night after the operation, better than he had done for months; he was up and about the ward in a few days, and has had no pain since.

The results of the above cases, I think, speak for themselves, and require no further comment. I have given the briefest outline of them, for, as previously said, I intend publishing them in full when a longer time has elapsed. In the meantime, when last heard of, the patients had been relieved for periods of three years, fourteen months, thirteen months, six months, three months, and five months, and even should the neuralgia again return, these many months of respite should alone compensate for the few days' confinement necessitated by the operation.

A few words on the methods of stretching the inferior dental and auriculo-temporal nerve. The operations for stretching the supra- and infra-orbital are too well known to call for any remarks. The inferior dental has been exposed in various ways:[1] (1) by division of the cheek, through its entire thickness, at a spot corresponding with the anterior edge of the ramus of the jaw, without dividing the mucous membrane; (2) by division of the cheek at a spot corresponding with the sigmoid notch; (3) by division of the soft parts over the posterior border of the ramus of the jaw in a direction from behind and below, inwards and upwards; (4) by removal of a portion of the angle of the jaw; (5) by trephining the ramus after division of the soft parts just above the commencement of the inferior dental canal; (6) from within the mouth. The last method of exposure was the one used for stretching the nerve in the above cases, and although I worked it out in the dissecting room—not knowing that it had been already employed—I found, on looking up the subject, that it would appear to have been first resorted to by Paravicini. Its superiority over the other methods cannot, I venture to think, be questioned. No scar is left externally, and if the anatomy of the parts be borne in mind, the operation should not be attended with much, if any, difficulty. The mouth having been opened by a gag, an incision through the mucous membrane only is made from the last molar tooth in the upper jaw to the last molar tooth in the lower. The finger is now introduced into the wound and insinuated between the ascending ramus of the jaw and the internal pterygoid muscle. The small spur-like projection of bone at the entrance of the inferior dental canal is next felt for, and serves as a guide to the nerve. An aneurysm

[1] *Wiener medizinische Wochenschrift*, March 31, 1874, and *London Medical Record*, 1874, p. 275.

needle with a very short curve is now passed and hooked round the nerve, which can be then drawn visibly into the entrance of the wound. There are no important structures with the exception of the inferior dental artery and gustatory nerve in the near neighbourhood. The latter is best avoided by remembering that whilst the inferior dental nerve passes into the bone the gustatory continues its course between the bone and the muscle, and is anterior and a little internal in its relative position to the inferior dental. Should the artery be wounded it will probably be torn rather than cut, and therefore not likely to bleed; were it to do so it is doubtful whether it could be tied, as the wound is deep and will barely admit the finger. There was no hæmorrhage in any of the above-related cases, but had there been I should have endeavoured to staunch it by plugging.

The internal lateral ligament which is inserted into the spur-like process of bone, follows somewhat the same course as the nerve, and may readily be mistaken for it. To avoid it the point of the aneurism needle should be made to hitch in the entrance of the canal, and thence swept upwards, backwards, and outwards around the nerve, keeping the point close to the bone. As the parts can hardly be seen the sense of touch must be trusted to as our guide. The wound, if the operation is neatly done, is small, and heals kindly and in a few days.

I am not aware that the auriculo-temporal nerve has been hitherto stretched; but I have found a case recorded by Dr. McGraw,[1] in which the nerve was divided. The best guide to the nerve is the temporal artery. An incision about an inch long should be made parallel and immediately posterior to the artery, beginning just above the zygoma. Having carefully exposed the artery the nerve will be discovered just below and posterior to it. The nerve being of small size the dissection must be done neatly, or it will not be found.

Meckel's ganglion I removed by the operation which is known as Carnochan's. A description of this operation will be found in the *Proceedings of the Royal Medico-Chirurgical Society* (vol. i. No. 5, New Series) by Mr. Chavasse, and in the discussion that followed his paper an account of some modifications which I suggested might be desirable to make in its performance.

[1] *Detroit Medical Journal*, November, 1877.

MICRO-ORGANISMS AND DISEASE.

BY E. KLEIN, M.D., F.R.S.

Joint-Lecturer on General Anatomy and Physiology in the Medical School of St. Bartholomew's Hospital, London.

(*Continued from* vol. xxxii. p. 426.)

CHAPTER XI. *continued.*

(*l*) *Bacillus anthracis.*—Pollender,[1] Brauell,[2] Davaine,[3] and then Bollinger[4] recognised in the blood of animals dead of malignant anthrax the presence of stiff short and long rods, which Davaine called *bactéridie du charbon.* They were identified by Cohn[5] as bacilli in morphological respects similar to bacillus subtilis, except that the bacilli anthracis are non-motile.

Koch[6] showed the ubiquitous distribution of these bacilli in the blood of the organs and especially of the spleen. He succeeded in cultivating these bacilli artificially, taking a bit of spleen of a mouse (which animal is very susceptible to fatal anthrax), and watching the growth of the bacilli in a microscopic specimen. He saw that the rods multiply by division, and that they grow into long, homogeneous-looking, straight or twisted filaments in which after some time, and with free access of air, bright oval spores make their appearance, while the filaments become homogeneous and swollen. These spores become free, and when artificially cultivated or injected into a rodent animal, germinate into the characteristic bacilli; these elongate and divide, and in

[1] *Viertelj. f. gericht. Med.* 1855.
[2] *Virchow's Archiv*, vol. 14, 1858.
[3] *Comptes Rendus*, lvii. 1863.
[4] *Med. Centralblatt*, June, 1872.
[5] *Beitr. z. Biol. d. Pflanzen*, vol. ii.
[6] *Ibid.* vol. iii.

artificial cultures again grow into the long leptothrix filaments, which again form spores. Koch[1] saw in preparations of aqueous humour kept at 35° C. in the incubator the spores germinating after three to four hours. The single bacilli as they present themselves in the blood measure between 0·005 and 0·02 mm. in length, and 0·001 to 0·0012 in thickness; they are truncated.[2]

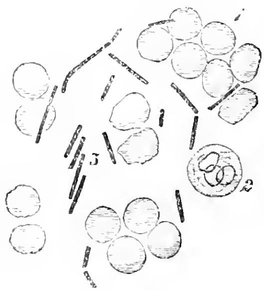


FIG. 61.—HEART'S BLOOD OF A MOUSE DEAD OF ANTHRAX.
1. Blood-discs.
2. White blood-corpuscle.
3. Bacilli anthracis.
Magnifying power 700. (Fresh specimen.)

The spores produced by growing the bacilli with free access of air are about 0·001 mm. thick, and about 0·002 to 0·003 mm. long. They are not stained by dyes and differ herein from the bacilli.

In the human subject malignant anthrax occurs as "woolsorter's disease"; for the ætiology and pathology of this malady see Spears (*Report of the Medical Officer of the Local Government Board*, 1881 and 1882) and Greenfield (*ibid.* 1881).

All rodents and herbivorous animals are susceptible to anthrax; rats are, however, infected with difficulty, pigs are very insusceptible, and so are dogs and cats. Infection of animals can be produced by inoculation into the skin and subcutaneous tissue, intravascular injections, and by inhalation of spores (Buchner, *Untersuchungen über niedere Pilze*, by Prof. v. Nägeli, 1882, p. 178). In woolsorter's disease the usual mode of infection is by inhalation of spores adhering to the wool of the fleeces of animals (sheep, goats) dead of anthrax. As in rodents infected with anthrax, so also in man, the blood-vessels of all organs contain the bacilli, and extravasations of the infected blood are frequent in many parts of the body. The presence of bacilli in the extravasations into the mucous membrane of the trachea and bronchi does not necessarily mean that these parts represent

[1] *Beitr. z. Biol. d. Pflanzen*, vol. ii. part ii. p. 288.

[2] It is generally assumed that the bacilli are the same in all animals affected with splenic fever, but this is most undoubtedly not the case, as has been already pointed out by Huber (*Deutsche med. Woch.* 1881); the bacilli of the guinea-pig are thicker than those of the mouse or sheep, and these again are thicker than those in the rabbit.

the points of entrance of the bacilli into the system, as Greenfield seems to regard as self-evident (*Reports of the Medical Officer of the Local Government Board*, 1881). As a matter of fact I find in every lung of mouse, rabbit, and guinea-pig, dead after subcutaneous inoculation with anthrax, bacilli anthracis in the alveolar cavities and in the smaller and larger bronchi. Ingestion of bacillus-containing material is sometimes followed by anthrax, but in these cases abrasions in the mucous membrane of the mouth, pharynx, or gut, may have been the real place of entrance. Mice fed with anthrax material do not become infected (Klein, *ibid.* 1881). But the reported cases of intestinal mycosis (see for the literature of this subject, Koch, "Ætiologie d. Milzbrandes," *Mittheil. a. d. k. Gesundheitsamte*, 1881) seem nevertheless to indicate that such a mode of infection, namely, by the alimentary canal, is not excluded. Compare also Falk, *Virchow's Archiv*, vol. 93.

Rodents inoculated with the bacillus of the blood or spleen of an animal dead of anthrax, or with the bacillus or spores of an artificial culture, die generally within forty-eight hours; in some instances in twenty-four to thirty hours, in other exceptional instances after forty-eight to sixty hours. The blood in all instances contains the bacilli, the spleen is large and full of

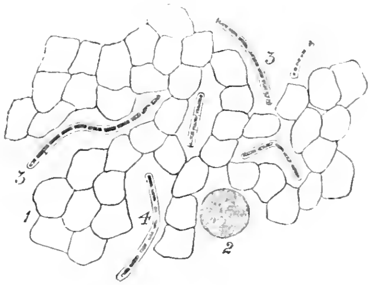


FIG. 62.—FROM A PREPARATION OF HEART'S BLOOD OF A GUINEA-PIG DEAD OF ANTHRAX.
1. Red blood-discs.
2. White corpuscle.
3. Bacilli anthracis.
Magnifying power 700. (Stained with Spiller's purple.)

bacilli, and so are the blood-vessels of most other organs, the exudations, and the urine. In the placenta of a pregnant guinea-pig dead in consequence of inoculated anthrax, I have seen that the bacilli keep strictly as a rule within the maternal blood-vessels, and are wholly absent in the blood of the vessels of the fœtus. Subcutaneous inoculation or injection into the cutis of the minutest quantity of bacillus-containing material (blood or artificial culture) invariably produces death. Subcutaneous injection of bacillus-containing material in the guinea-pig almost

always produces a characteristic œdema, spreading sometimes over a large area. The œdematous fluid is clear and contains only a few bacilli.

Archangelski (*Centralblatt f. d. med. Wiss.* 1883, p. 257) claims to have ascertained that if an animal be inoculated with anthrax, many hours before the bacilli appear in the blood, there are present numbers of spores. Just before death they all become changed into the bacilli. He further maintains, that those spores taken from the blood can be shown to multiply by division, and without changing into bacilli, by cultivating them artificially with exclusion of oxygen. I have shown, however (*Reports of the Medical Officer of the Local Government Board for* 1883), that none of these assertions are borne out by actual observation, and that they are erroneous.

Any fluid containing proteid material is a suitable nutrient medium for the bacilli; they grow abundantly at all temperatures between 15° and 43° C., best between 25° and 40° C. They elongate and divide rapidly, and the bacilli grow out into long curved and peculiarly twisted filaments which often form bundles, the individual filaments being twisted round one another like the strands of a cable.

The bacillus anthracis grows best in neutral fluids, but to a limited extent also in acid or alkaline fluids containing proteid

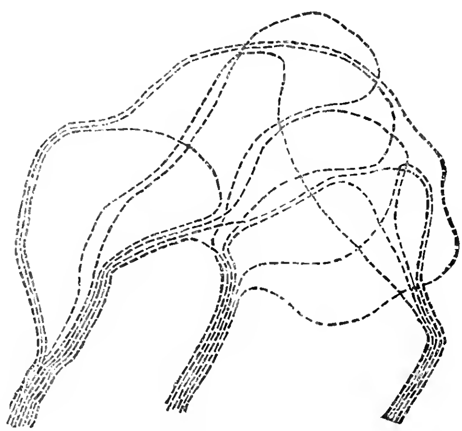


FIG. 63.—FROM AN ARTIFICIAL CULTURE OF BACILLUS ANTHRACIS.

Convolutions of threads, each composed of bacilli.
Magnifying power 300. (Stained with Spiller's purple.)

material. When growing in neutral nourishing fluids, it forms on the bottom of the fluid characteristic fluffy whitish masses,

which are convolutions of the characteristic filaments. These appear homogeneous in the fresh state, their ends being slightly thicker and rounded. Examined in preparations made after the Weigert-Koch method (*i.e.* drying of a thin layer and staining it with aniline dyes, washing in water, then in spirit, then again in distilled water, and then drying and mounting in Canada-balsam solution), all the bacilli and their filaments are seen to be composed of a thin hyaline sheath, and in this is a row of cubical or rod-shaped masses of protoplasm taking the dye very readily. According to the length of the bacilli the number of these *elementary masses of protoplasm* varies. Some of the rod-shaped elements appear constricted in the middle, preparatory to division. Between each two elements is a fine septum.

Bacilli anthracis when growing at ordinary temperatures on a solid medium (*e.g.* a mixture of gelatine and broth, or Agar-Agar

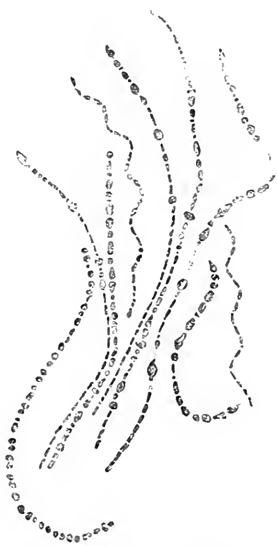


FIG. 64.—FROM AN ARTIFICIAL CULTURE OF BACILLUS ANTHRACIS, CARRIED ON AT ORDINARY TEMPERATURE AND ON SOLID (GELATINE) MATERIAL. TORULA FORM. Magnifying power 450. (Stained with Spiller's purple.)

and peptone) show a very peculiar modification, inasmuch as some of the elements assume a spherical or oval shape, a torula form, and as such they multiply by gemmation and division, and form clusters or arrange themselves in chains. By and by each

of these spherical elements elongates into a rod, and when all elements have undergone this change we have the typical smooth filament of the leptothrix-form. Some of the elements in such a filament remain for a long time of a spherical shape, and are much larger, looking like the sporangium of a nostoc-alga. The most interesting forms are those where an ordinary smooth filament of anthrax bacillus at its growing ends shows itself to be composed of a chain of torula-elements. Such torula-forms occur also in ordinary cultivations in fluid media at temperatures of 20° to 30° C., but not by any means so often as at ordinary temperatures and in a solid medium. These torula-cells are about 0·0013 to 0·0026 mm. in diameter. The torula-forms are very virulent, but in an animal always assume the ordinary shape of the typical bacillus.[1]

As has been mentioned in treating of pigment bacilli, such a torula-form has been also observed by Neelsen in the bacillus that causes the colour of "blue milk;" and Zopf[2] has observed it also in cladothrix dichotoma.

I have also observed this torula-modification in the filaments of septic bacilli, in a bacillus that I found growing accidentally in pork-broth. The bacillus had the same morphological characters as the bacillus subtilis of hay-infusion, and also formed a pellicle composed of filaments. In some of the filaments the large torula-like cells could be seen here and there interposed between cubical and cylindrical cells.

On inoculating fluid media (*e.g.* broth of any kind or peptone fluid) with the bacilli anthracis, either those of the blood or of the spleen of an animal dead of anthrax, and shaking the fluid so as to distribute the bacilli uniformly through the fluid and exposing this to a temperature of from 25° to 40° C., it will be noticed that after twenty-four to forty-eight hours' incubation the fluid is uniformly turbid, owing to the rapid multiplication of the bacilli. These are shorter or longer typical anthrax-bacilli. But as incubation proceeds all the bacilli grow into filaments, and these being heavier sink to the bottom of the fluid and form the characteristic whitish fluffy convolutions. But on inoculating dilute broth, care being taken that the inoculating material,

[1] Klein, *Quart. Journ. of Microsc. Science*, April, 1883.
[2] *Zur Morphologie d. Spaltpflanzen*, ii. and *Die Spaltpilze*, Breslau, 1883.

whether consisting of blood-bacilli, bacilli of a culture, or spores of culture-bacilli, is deposited at once on the bottom of the fluid and this is not shaken up, it will be noticed on incubation that the fluid remains limpid. All the growth, in the shape of the fluffy whitish masses, takes place at the bottom.

After a few days' incubation, no matter what the temperature is, many of the bacilli and their leptothrix-filaments show signs of degeneration, consisting in the granular disintegration and absorption of the protoplasmic contents of the bacilli and their filaments, at first only here and there, but by and by over longer pieces. Such bacilli and leptothrix-filaments appear in such places as if empty. This is also noticed in the bacilli of the

FIG. 65.—FROM A PREPARATION OF THE BLOOD OF SPLEEN OF A GUINEA-PIG DEAD OF ANTHRAX.

1. White blood-corpuscle.
2. Red blood-discs, shrunken.
3. Chains of Bacillus anthracis.
4. Degenerating bacilli, the sheath only being preserved.

Magnifying power 700. (The preparation has been stained with gentian-violet.)

blood and spleen of an animal inoculated with anthrax even at the point of death or soon after death, if the number of bacilli is great.

Another form of degeneration consists in the filaments of bacilli becoming much curled and swollen, and finally disintegrated into an amorphous débris.

As long as the bacilli grow in the depth of a fluid they never form spores, but when grown on the surface with free access of

air, or on solid media (*e.g.* serum gelatine, gelatine broth, Agar-Agar, potato, &c.), the bacilli, having developed into filaments, proceed to form spores. But they may form spores even in fluid media if by some accident, either by sticking to the glass vessel containing the fluid or by means of a cotton-wool fibre, some of the bacilli remain on the surface of the fluid. This formation of spores is not due to exhaustion of the nourishing medium, as is maintained by Buchner—it has, in fact, nothing to do with it—but represents the last stage in the life-history of the bacilli, provided they have an ample supply of oxygen. If this latter condition is not fulfilled, as when they are grown at the bottom of a fluid, the bacilli gradually degenerate as mentioned above.

Spore-formation occurs, *cæteris paribus,* at all temperatures between 18° and 45° C. Koch found 15° C. the lower limit. Pasteur states that in a nutrient medium exposed to a temperature of 42° to 43° C. the bacilli are not capable of forming spores; but this is not correct, for when the bacilli are growing on the surface of the nutrient medium, they form spores even at a temperature of 44° to 45° C., as I have conclusively shown by growing them on Agar-Agar and peptone mixture. The spore-formation consists in the appearance of a bright glistening spherical body in the protoplasm of an elementary mass or cell; this body gradually enlarges till it reaches its full size, becoming at the same time oval. The bacilli at these points are thicker than where no spore-formation has set in. Under the most favourable conditions, each elementary cubical or rod-shaped mass of protoplasm includes one spore, in which case the bacillar filament contains an almost unbroken row of spores; but in other cases only an elementary mass here and there contains a spore, the rest breaking down and becoming absorbed. In the first case also, the protoplasm of the elements almost entirely disappears, the sheath swelling up and becoming hyaline, and only the bright spores remaining. Their linear arrangement, however, still indicates that they were formerly contained in one filament.

If bacilli grow in the depth of a fluid medium, they do not form spores, as has been stated above; and as we have also seen, as new bacilli appear, or the old filaments increase in length,

degeneration sets in. This degeneration gradually affects greater and greater numbers, and when the fluid is exhausted for the formation of new bacilli, it necessarily follows that the whole growth gradually becomes involved in the process of degeneration, the whole mass becoming smaller, and finally only débris is left. Such cultures, namely, those in which the degeneration involves the whole mass of the bacilli, are quite innocuous when

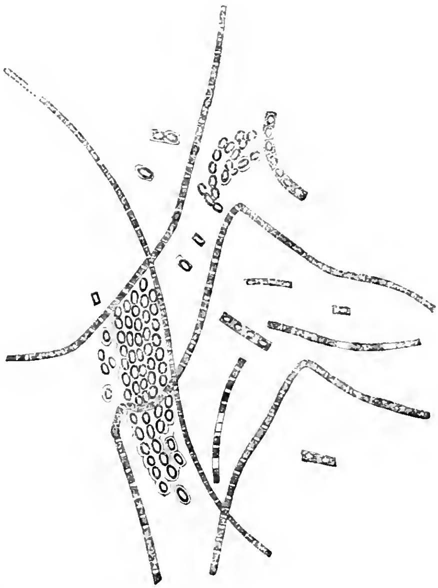


FIG. 66.—FROM AN ARTIFICIAL CULTURE IN NEUTRAL PORK-BROTH OF BACILLUS ANTHRACIS, WITH COPIOUS FORMATION OF SPORES.
Magnifying power 700. (Stained with Spiller's purple.)

inoculated into animals, or into fresh nourishing media. But as long as there are any good protoplasmic elements of the bacilli left, the culture is virulent to rodents, with the exception of mice, as will be stated presently; and it is capable, when transferred to new suitable nourishing media, of starting new cultures that prove virulent to all rodents and sheep.

The same holds good of the bacilli in the blood and organs of an animal dead of anthrax, provided the animal be not opened and its organs, exudations, or urine, be not exposed to the free air; for the bacilli not exposed to the air gradually degenerate and the blood and organs of such an animal, although at first

deadly poison to other susceptible animals, become at length quite innocuous. Systematic observation has shown me that small animals, such as mice and guinea-pigs, when kept unopened or buried in earth, become quite innocuous after five to eight days, the anthrax-bacilli having by this time, by degeneration, altogether disappeared from the blood, spleen, and other organs. Pasteur's statement that in animals dead of anthrax and buried, the bacilli form spores, that these spores are taken up by earthworms and carried to the surface of the soil, where they are deposited with their castings and thus are capable of infecting animals grazing or sojourning on this soil, is not borne out by the above observations. And further, Koch has proved[1] by direct experiment that spores of anthrax-bacilli, when mixed with earth in which worms are present, are not taken up by these creatures.

Drying bacilli of the blood or of a culture in a thin layer invariably kills them, but the spores remain unaffected.

The bacilli of the blood of a rodent dead of anthrax are always thinner than the bacilli cultivated in a neutral fluid medium, like pork-broth.

Cultivation of the blood-bacilli at temperatures varying between 20° and 40° C. in any suitable nourishing material, solid or fluid, however many transferences (new cultivations, or so-called new generations) be made, always yields a crop of virulent bacilli. It is absolutely incorrect to say, as Buchner[2] and Greenfield[3] maintain, that continued transference weakens the action of the bacilli; as long as the cultures remain pure, not contaminated and finally suppressed by accidental innocuous bacilli, the anthrax-bacilli retain their full virulence.

Cultures of the blood-bacilli at 20° to 38° C. in fluid media, *e.g.* neutral pork-broth, during the first or second week, are virulent to mice, guinea-pigs, and rabbits; but after that they lose their power on mice, provided the growth takes place only in the depth, and no spores are formed; but they retain it, as regards guinea-pigs and rabbits, as long as they contain good bacilli at all.[4] But fresh cultures made of such

[1] *Mittheil. a. d. k. Gesundheitsamte*, 1881.
[2] *Ueber d. Erzeug. des Milzbrandes*, Munich, 1880.
[3] *Proceedings of the Royal Society*, June 17, 1880.
[4] Klein, *Reports of the Medical Officer of the Local Government Board*, 1881.

bacilli invariably produce a growth which is fatal to all rodents during the first or second week.

Pasteur has stated that blood-bacilli which have become attenuated in virulence by exposure to 42° to 43° C. for twenty days are capable of starting new cultures of attenuated virus. This I question, for I find that such a culture starts new cultures of virulent bacilli; in the same way the bacilli of a culture that is only "vaccine" for sheep, when it is inoculated into a guinea-pig kills it with anthrax, and then yields bacilli that are fatal to sheep.

Blood-bacilli exposed to a temperature of 55° C. or to a solution of $\frac{1}{2}$ to 1 per cent. of carbolic acid, lose their virulence (Toussaint). Chauveau found that exposure to a temperature of 52° C. for fifteen minutes, or of 50° C. for twenty minutes, destroys the virulence of the blood-bacilli. Pasteur [1] ascertained that by cultivating blood-bacilli in chicken-broth at 42°—43° C. they lose their virulence after twenty days' cultivation, not as Pasteur thinks owing to the action of oxygen, but owing to the high temperature; and when such bacilli are injected into sheep and cattle they do not kill though they induce sometimes a slight illness. After this illness has passed off, the animals are protected against virulent anthrax. But with reference to this "vaccination," it must be borne in mind that twenty days' cultivation of blood-bacilli at 42°-43° C. does not always yield attenuated virus,[2] and also that sheep and cattle not killed by inoculation of attenuated virus produced by Pasteur's method [3] or by other means (see below), although they are protected against virulent anthrax, remain so only for a limited time, probably about nine months.

In all these experiments with the anthrax-bacillus it is necessary to bear in mind that by passing the bacilli through different species of animals they become endowed with different qualities and that bacilli which are fatal to some are not fatal to all

[1] *Comptes Rendus*, 1881; *Transactions of the International Medical Congress in London*, 1881, vol. i.

[2] Klein, *Reports of the Medical Officer of the Local Government Board*, 1882.

[3] Pasteur thinks that such cultures remain free of spores because of the temperature of 42°–43° C.; but this is not so, as has been pointed out above; the statement only holds good so long as the bacilli are prevented from growing on the surface.

animals. While, for instance, the blood-bacillus of sheep or cattle dead of anthrax invariably produces death when inoculated into sheep or cattle, after passing through white mice[1] it loses this virulence for sheep and cattle. The blood of white mice dead of anthrax does not kill sheep; it produces only a transitory illness and the animals are, for a time at least, protected against

FIG. 67.—FROM A SECTION THROUGH THE KIDNEY OF A RABBIT DEAD OF ANTHRAX.

The capillaries of the cortex are naturally injected with the Bacillus anthracis.
1. A glomerulus.
2. Capillaries surrounding the convoluted uriniferous tubules not shown here.
Magnifying power 450. (Spiller's purple.)

virulent anthrax. The blood of guinea-pigs dead of anthrax produces illness, sometimes death, in cattle, but as a rule does not kill (Sanderson and Duguid), and the blood of the biscachia of South America does not kill cattle, while it gives

[1] Klein, *Report of the Medical Officer of the Local Government Board*, 1882.

them a transitory illness, and after this immunity for a time.[1] Again, Pasteur's "vaccine" which as a rule (but not without exception) does not kill sheep or cattle, is fatal to rodents.[2] From all this it follows that as regards virulence the bacilli anthracis differ in the different species of animals, and in them acquire different qualities. A culture that does not kill mice, such as an artificial culture of blood-bacillus after one or two weeks' incubation at 20°-35° C., or a culture that for other reasons, as when attenuated by heat or antiseptics, does not produce fatal anthrax in guinea-pigs, fails to give to these animals any immunity whatever. Rodents, so far as my experience goes, either die of inoculation with anthrax-bacilli or they do not die; but they cannot be provided with immunity by any attenuated virus.

Koch [3] maintains that in neutral chicken-broth the bacilli growing at 42° C. lose their virulence in thirty days, and at 43° C. in six days, first for rabbits, then for guinea-pigs, and lastly for mice. I am quite sure from my own observations, that these results are uniformly obtained, since I have seen anthrax-bacilli very virulent both for rabbits and guinea-pigs even after growing for thirty-six days at 42°·5 C.

Bacillus anthracis is capable, as we have seen, of growing well outside the body and, when well supplied with oxygen from the air, of forming spores which represent the permanent seeds. Thus if animals, such as sheep and cattle, die of anthrax in a field, the bacilli of the effusions from such animals (*e.g.* urine, blood, effluvia from the mouth and nostrils) always contain numbers of the bacilli, and these will be able to grow indefinitely on the surface of the soil, there being always present a large amount of suitable nourishing material, like vegetable and animal decaying matter, and as free access of air is always ensured they will eventually form spores. Such soils, owing to the presence of these spores, will remain a permanent source of infection to sheep and cattle sojourning on them (Koch).

[1] Roy, *Nature*, December, 1883.

[2] Klein, *Reports of the Medical Officer of the Local Government Board*, 1882. Similar results have been obtained by Gaffky (*Mittheil. a. d. k. Gesundheitsamte*, 1884).

[3] *Ueber d. Milzbrandimpfung*, 1882.

(*m*) *Bacillus tuberculosis* (Koch).—In all cases of tuberculosis in man, cattle (Perlsucht) and monkeys, of tuberculosis artificially produced (by inoculation with human or bovine tuberculous matter) in cats, guinea-pigs, rabbits, and rats, and in spontaneous tuberculosis in birds (hens), Koch[1] found in the fresh state, and particularly after staining with methylene-blue and vesuvin, peculiar fine bacilli, some with bright oval spores, some without, some smooth and homogeneous-looking, others more of a beaded appearance. One cubic centimetre of a concentrated alcoholic solution of methylene-blue is mixed with 200 ccm. of distilled water; to this are added two ccm. of a ten per cent. solution of caustic potash. In this solution the fresh or dried sections or particles of tubercles are kept for half an hour if heated up to 40° C., or for twenty-four hours if not heated. After this the preparation is stained for two minutes in a filtered concentrated watery solution of vesuvin, then washed in distilled water. On examination with a $\frac{1}{12}$ oil-immersion lens and Abbé's condenser, it will be found that all the elements are stained brown with vesuvin except the bacilli,

Fig. 68.—From a Preparation of Human Tuberculous Sputum, Stained after the Ehrlich-Weigert Method.
The nuclei are stained blue, the tubercle-bacilli pink. Magnifying power 700.

which are blue. A still more successful and more delicate reaction is shown by the bacilli if the preparation is stained after Ehrlich's method. About 5 ccm. of pure

[1] *Berliner klin. Wochenschrift*, xv. 1882.

aniline (aniline oil) are well mixed with 100 ccm. of distilled water and filtered; to this is added a saturated alcoholic solution of fuchsin, and with this the preparation is stained for a quarter to half an hour. It is then washed for a few seconds in a mixture of one part of nitric acid and two parts of water, and then is well washed in distilled water. The preparation when now examined shows no trace of colour except in the tubercle-bacilli, which retain the red colour of the fuchsin. The tissue may now be stained either with vesuvin or methylene-blue, which makes the ground-work brown or blue, but the bacilli remain red. This reaction after washing with nitric acid is exceedingly delicate, and is perfectly characteristic and trustworthy, as all putrefactive organisms become discoloured by the washing with nitric acid, the tubercle-bacilli only retaining the colour. There are other methods which are very good; those of Weigert and of Gibbes [1] are very quick and trustworthy in their action.

Weigert has devised a staining fluid which gives very beautiful results and is very useful for staining sections, fresh or hardened; it is as follows:—Take of a two per cent. watery solution of gentian-violet 12 ccm., and of a saturated watery solution of aniline oil 100 ccm. Mix. This is used like an ordinary staining-fluid for the first stain. For the second or contrast stain the following solution is used:—

Bismarck brown	1 gramme.
Spiritus vini rectificati (sp. gr. ·830) .	10 ccm.
Distilled water	100 ccm.

The sections remain in a few drops of this solution for fifteen minutes. This method yields the finest specimens of tubercle-bacilli in sections through tuberculous growths that I have seen; unfortunately the colour of the bacilli is very liable to fade.

In the case of tuberculous sputum, or similar matter, a small droplet or particle is spread out in a thin layer on the cover-glass, well dried by passing it over the gas flame of a Bunsen burner, and then stained in the way described in

[1] *Lancet*, August 5, 1883.

Chapter I. Sections of tubercles, fresh or hardened, are stained without first drying.

In all cases of human tuberculosis, particularly in the sputum, in caseating scrofulous glands, in bovine tubercles, in artificially-

FIG. 69.—FROM A PREPARATION OF CASEOUS MATTER FROM PULMONARY DEPOSITS IN BOVINE TUBERCULOSIS, STAINED AS IN PRECEDING FIGURE.
Magnifying power 700.

induced tubercles and caseating glands of rodents, the tubercle-bacilli have been shown to exist. They are most numerously

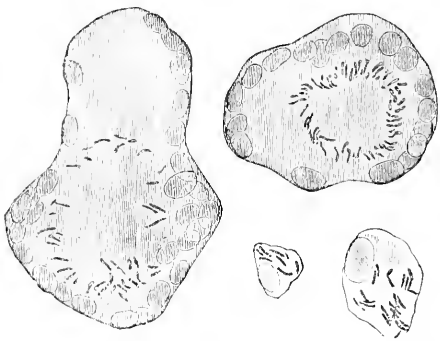


FIG. 70.—FROM A SECTION THROUGH TUBERCULOUS DEPOSITS IN THE LUNG OF A COW. Two giant-cells and two small cells containing tubercle-bacilli. Magnifying power 700.

found in the caseous masses in the lung found in bovine tuberculosis. Here Koch found them not only scattered through the caseous masses, but also in the well-known giant-cells; in some cases they form a more or less regular zone in the peripheral portion of the cell. But according to Koch the bacilli by and by disappear again from the giant-cells.

The bacilli do not show any motility and often include spores;

they are thus capable of forming spores within the body. Owing to these spores, human phthisical sputum retains its virulence even after drying for considerable periods. Koch cultivated the bacilli artificially, *i.e.* outside the body, and by carrying on the cultivation for several successive transmissions succeeded in isolating and clearing them from the tuberculous tissue. These pure bacilli, no matter how many times they have been transferred, no matter how far removed from their original breeding-ground, always produced the characteristic disease when inoculated into suitable animals. The cultivation succeeded equally with material derived from human tubercles, from bovine tubercles, and from the artificially-induced tuberculosis of guinea-pigs. The bacilli grow well at a temperature varying between 37° and 39° C. in solid serum, Agar-Agar peptone mixture, and solidified hydrocele fluid[1] (see Chapter II.). An incision is made into a tubercle with clean (superheated) scissors, and a particle of a tubercle is taken up with the point of a clean (superheated) needle and deposited on the top of one of these sterile solid media kept in a test-tube plugged with sterile cotton-wool. After keeping it for ten days or a fortnight in the incubator at 37°-39° C. the first traces of growth make their appearance in the shape of small dry whitish scales, which gradually increase in size until they coalesce. These scales are made up of the typical tubercle-bacilli lying closely side by side; some of the bacilli are longer, others shorter, and many of them have spores. New cultures may be established from these bacilli. Inoculation with them or with further cultivations into the subcutaneous tissue, peritoneal or pleural cavity of guinea-pigs and rabbits, produces after three, four, or more weeks, the typical lesions characteristic of artificial tuberculosis; namely, swollen lymphatic glands near the seat of inoculation, with subsequent caseation and ulceration; enlargement of the spleen due to numerous whitish tubercles, the larger ones caseous; enlargement of the liver, which is mottled by the presence of uniformly distributed whitish points and streaks, which by and by become confluent and caseous; tuberculosis of the peritoneum; isolated

[1] I ought to have stated in Chapter II. that solidified hydrocele fluid has been successfully used for the cultivation of the tubercle-bacilli, not by Koch (as there stated), but by my friend Mr. Makins of St. Thomas's Hospital.

tubercles in the lungs, at first grey and transparent, then caseating in the centre; enlargement and subsequent caseation of the bronchial glands.

Owing to the fact that the tubercle-bacilli require for their growth high temperatures (38–40° C.), it is evident that, unlike some other pathogenic organisms, they do not thrive in the outside world in temperate climates.

Inoculations with the pure bacilli into the anterior chamber of the eye of rabbits and guinea-pigs produces the characteristic tuberculosis described by Cohnheim and Salomonsen. After an incubation of from two to three weeks there appears on the iris a crop of minute grey tubercles enlarging and undergoing caseous degeneration. Later on general tuberculosis of the eyeball and other organs follows. So that Cohnheim's assertion, that only tuberculous matter implanted into the anterior chamber of the eye can produce this outbreak of a crop of tubercles on the iris, is, by Koch's observations, strengthened in the highest degree; the tubercle-bacilli present in, and characteristic of, true tubercles are thus manifestly connected with the real cause of the morbid growth. A large number of pathologists have, since the publication of Koch's paper, devoted themselves to various parts of this question of the relationship of the tubercle-bacilli to the tuberculous process, and have, with few exceptions, verified Koch's observations. The chief opposition, leaving out of account those who, either from imperfect technical skill in the manipulation and staining of the bacilli, or by reason of the inadequate number of their observations, have denied Koch's statements, comes mainly from observers who, like Toussaint, Klebs, and Schüller, maintain that tuberculosis is due to a micro-organism which is a micrococcus and not a bacillus, or who, like Schottelius and others, do not admit that human and bovine tuberculosis are the same, and are, therefore, not interchangeable, which they ought to be if in both the same bacillus occurs and if this bacillus is the *vera causa morbi*. But there can be no doubt that a vast number of competent observers have fully verified Koch's dictum, that the tubercle-bacilli are specific and different from other bacilli, except those of leprosy, as regards their chemical nature (compare their behaviour to nitric acid); and that wherever they are present in the sputum

we have to deal with real tuberculosis, wherever after repeated examinations they are found to be absent there is no tuberculosis. This has by this time, although not much more than a couple of years has elapsed since Koch's first publication, become in the hands of all competent workers a matter of daily practical application, especially as regards the examination for bacilli of the sputum of patients suspected of tuberculosis.

The other equally important part of Koch's discovery, namely, the artificial cultivation of the tubercle-bacilli and the production with them of tuberculosis, has also been verified by Weichselbaum.[1] Weichselbaum also ascertained[2] that in acute miliary tuberculosis of man the blood contains the bacilli.

An important series of observations was published by Mr. Watson Cheyne in the *Practitioner* for April 1883, in which he

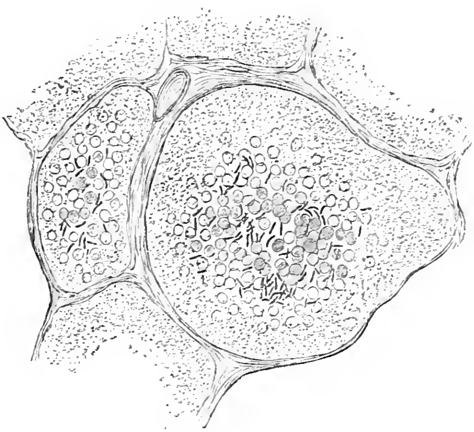


Fig. 71.—From a Section through a Tubercle of the Lung from a Case of Acute Miliary Tuberculosis in a Child.

Several alveoli are seen filled with *débris;* in the centre of this are numerous nuclei, and amongst them the tubercle-bacilli. Magnifying power about 350.

proved, (1) That the organs of rabbits and guinea-pigs suffering from the tuberculosis induced by Toussaint's cultivations from the blood of tuberculous animals, which cultivations Toussaint considered to be those of micrococci, turned out, on careful microscopic examination and suitable staining, to contain the typical tubercle-bacilli; (2) That inoculations with cultures of

[1] *Wiener med. Blätter*, 1883. [2] *Ibid.* 10, 1884.

Toussaint's pure micrococci not containing any tubercle-bacilli did not produce tuberculosis in animals; (3) That Koch's assertions as regards the constant occurrence of the tubercle-bacilli in the tubercles of animals artificially tuberculised are quite correct; (4) That material other than tuberculous does not produce tuberculosis, that is to say, that the cases of artificial tuberculosis in guinea-pigs observed by Wilson Fox and Burdon Sanderson, and in the older experiments of Cohnheim and Fraenkel, viz. those in which chronic inflammation and caseation (*i.e.* artificial tuberculosis) was thought to have been induced by other than tuberculous matter, *e.g.* by non-tuberculous caseous matter, setons, indifferent substances like bits of gutta-percha inserted into the peritoneal cavity, &c. were really due to accidental contamination with tuberculous material.

According to my own experience extending over a very large number of cases of human miliary tuberculosis and tuberculosis of cattle, I cannot for a moment accept the statement that the bacilli found in the two affections are identical; for I find that in the two diseases their morphological characters and distribution are very different. The bacilli of human tuberculosis are conspicuously larger than those of the tuberculosis of cattle, and in many instances more regularly granular. As is seen in Figs. 68-70, those of human sputum are nearly half, or at least one-third, as large again as those of the caseous masses from the lungs of cattle.

(*To be continued.*)

Reviews.

Bacteria and the Germ Theory of Disease. Eight Lectures delivered at the Chicago Medical College. By Dr. H. GRADLE. 8vo, pp. 219. Chicago: W. T. Keener. London: Trübner and Co. 1883.

IN a course of eight lectures Dr. Gradle explains the present state of our knowledge of bacteria in their relation to disease. All the theories that have been advanced to explain the presence and distribution of bacteria in various diseases are treated in a comprehensive and lucid manner, and there is no doubt that Dr. Gradle has well mastered the subject he speaks of. While fully appreciating the good service the author has rendered by these lectures towards the spreading of a true understanding of the important part bacteria play in the causation of disease, we must give it as our opinion that some parts of his book appear out of harmony with his general tenor and aim. Thus we think the old story of spontaneous generation is rendered in a somewhat unsatisfactory manner; we would rather see it left out altogether. The morphology of the bacteria is treated too imperfectly, and we fail to discover any satisfactory argument by which Dr. Gradle justifies his relegation of the genus *Bacterium* to the genus *Bacillus.* Statements appear here and there that cannot be accepted without qualification, as when on p. 29 we are told that "sporification always alternates with fission;" or, in speaking of bacilli, that "continued vegetation without change of soil is usually terminated by the formation of spores, and these spores will not as a rule germinate in the unchanged soil where they were produced." Dr. Gradle's assumption that in the ordinary pus of acute abscesses the micrococci when present are the cause of the suppuration is, to say the least, an expression of bacterial enthusiasm not shared by many pathologists. Statements such as (p. 182) those of Toussaint, that in sheep-pox a motile bacillus is associated with, or perhaps the cause of, the disease; and that of Le Bel about the "vibrio

of measles"; or even those of Cossar Ewart regarding the bacillus causing the well-known outbreak of milk-fever in Aberdeen, and of Sattler regarding the micrococcus causing trachoma, and of Salomon about a higher fungus causing diphtheria, should not have been cited without comment. The acceptance of such statements is liable to impair the otherwise sound critical judgment the student will be led to form from Dr. Gradle's work.

On the whole we think the book in many respects a praiseworthy production, and we have no doubt it will be fully appreciated, as it deserves to be, by medical students.

We would suggest that in a second edition a few illustrations might be introduced, so as to show the most important forms of bacteria occurring in disease, and also the addition of an Appendix describing the most approved methods of examination and cultivation of bacteria.

A Text-Book of Pathological Anatomy and Pathogenesis. By ERNST ZIEGLER. Translated and Edited for English Students by DONALD MACALISTER, M.A., M.D., &c. Part II. Special Pathological Anatomy (Sects. I.—VIII.). 8vo, pp. 371. London: Macmillan. 1884.

IT has been thought best to publish in a separate volume the first eight sections of the second part of this valuable text-book. The remaining sections will make a third volume, part of which is already prepared for publication. The present volume includes the pathology of the blood and lymph, of the heart and blood-vessels, of the spleen and lymphatics, of the serous membranes, of the skin and mucous membranes, of the alimentary tract, and of the liver and pancreas.

The numerous illustrations are excellent. Those of gumma of the liver are much clearer than most drawings of that change; while the excellent series of drawings of the microscopic structure of several skin diseases gives a thorough view of a part of morbid anatomy which has been too much neglected in text-books. Dr. MacAlister's version is distinctly a manual fitted to accompany a course of practical instruction in pathology. The student will find the most important facts of each part of the subject clearly and tersely expressed. The discussion of disputed points is suggested rather than pursued, and the student is encouraged to work steadily through the morbid anatomy and morbid processes of the body before pausing over the endless matters of debate which pathology affords. The professor knows much more than the pupil, and it is better to be somewhat dogmatic at first, then to give the learner the

impression that nothing is certain in pathology, and that all that is true to-day may be thought false to-morrow.

In the discussion of the various forms of cirrhosis of the liver and of the varieties of carcinomatous growth in that organ, Ziegler states with precision his own views, and thus best prepares the student for studying himself the difficulties which he will meet as his experience enlarges.

In a few places the statements are in our opinion a little too general. It would, for example, have been better to give more weight to those recent observations which establish the relation between morbid conditions of the gastric vessels and perforating gastric ulcer, and which establish its frequent, if not constant, relation to embolism and thrombosis. J. W. Ogle's observations on the formation of some forms of aneurism, and P. Kidd's account of the capillaries in hæmophilia, ought to find a place in a revised edition of the part detailing morbid changes in the vascular mechanism.

Dr. MacAlister's additions to the original references are of great value to the student, and they might be made even more numerous with advantage; though we admit that the counter danger of overloading this portion of the book is not slight. Of convenient size and easy of reference, this work is certainly the best manual of its kind in English. We trust the third and concluding volume will not be long delayed.

The Gheel Lunatic Colony. By G. A. TUCKER, Ph. D. Birmingham: Cornish Bros. 1884.

DR. TUCKER again recites the story of the foundation of this ancient lunatic colony. He speaks very unfavourably of the condition and treatment of the lunatics—numbering about 17,000—dwelling in the cottages of the sane inhabitants of Gheel. In his unfavourable statement, however, he more than once admits that the patients resident in private dwellings have a great dread of removal to the hospital, or asylum proper, "the restraints of which are evidently disliked." This admission somewhat qualifies Dr. Tucker's hostile picture of insane life in Gheel cottages, inasmuch as against the hospital itself he has nothing very startling to say. One can only infer that lunatics prefer discomforts with even a small measure of liberty to confinement in an institution.

Clinic of the Month.

Hydatid Cysts of the Orbit.—M. Dieu gives the following summary of an important paper on this subject:— (1.) Hydatid cysts of the orbit are tumours identical with those observed in other regions; the vesicles are solitary or multiple; the liquid they contain is of the same composition as that of other hydatids; hooks are of rare occurrence. (2.) These tumours are more frequent in men than in women; in 26 cases, 18 were men; nearly two-thirds of all the cases noted were below the age of 21, the youngest was 4½, the oldest 42. (3.) The symptoms observed are the same as those of other encysted tumours of the orbit. The peculiar fremitus of hydatid cysts was not however observed in any case. There is in general violent neuralgia, sometimes with great tendency to sleep. The course of these tumours is usually slow, lasting as long as six years. In some cases the tumour of the orbit may perforate the bones and communicate with the brain, giving rise to pulsations. The transparency of the cyst renders its diagnosis easy, but its precise nature cannot be determined without an exploratory puncture. The prognosis is serious, loss of vision having been noted in 20 out of 26 cases, whilst in three cases no note of the vision was taken. The treatment consists in making an exploratory puncture to render the diagnosis certain, and, when this has been determined, a free incision should be made, and the opening maintained by inserting a drainage-tube; not attempting to extract the enveloping membrane till it presents between the lips of the wound. (*Recueil d' Ophthalmologie*, Jan. 1884.)

Erysipelatous Eruptions produced by Arnica.—*L'Union Medicale* for August 17 contains a report presented to the *Société de Médecine* of two cases in which the application of pure tincture of arnica for the relief of contusions was followed by well-marked symptoms of vesicular erysipelas. Both subjects were females, of lymphatic temperament, and delicate sensitive skin, and the affection in both was entirely local. The reporter, M. Laissus, cites a number of authorities who have noted the

irritating effects of arnica on the skin, but has only found one writer (Ruddock) who has mentioned it as producing erysipelas. He concludes that, in view of its influence upon certain constitutions, this agent ought always to be employed in a state of considerable dilution. [Cf. PRACTITIONER, vol. xvi. p. 52.] (*Journal of Cutaneous and Venereal Diseases*, No. 12, vol. i.)

The Therapeutics of Insanity.—Dr. J. G. Rogers, of Indianapolis, in reporting on this subject to the annual meeting of the Association of Superintendents of American Institutions for the Insane, touches upon most of the agents employed in asylum practice. Both the report and the important discussion upon it show that there is a tendency to lessen the reliance placed upon narcotics as drugs which are specific in insanity. Much stress was laid upon the use of copious warm enemata "in gallon portions if necessary," and on tonic and nutrient methods of treatment. Amongst drugs, chloral, bromide of sodium, cannabis indica, ergot, phosphorus, and nitro-glycerine, were generally accepted as of special value. Opium was not spoken of with favour and "a good dose of whisky," disguised, was stated to be a satisfactory substitute for both it and chloral. Strange to say no mention whatever was made of digitalis, a drug which is often magical in its effects in the treatment of acute or recurrent mania. Hyoscyamine was favourably spoken of, and regarding it Dr. Bower reports to the Association that "an extended experience in its use here and in Europe within the last year or two has given this agent a prominent and permanent place in asylum *Materia Medica*." In the treatment of restless agitation several American superintendents recommend rest in a recumbent position. On this side of the Atlantic, the same patient would most likely be treated by means of an exhausting bout of field labour, Of course there are amongst American "alienists" men who are sceptical about all kinds of medication. One superintendent confesses mournfully, "I give my medicine as I say my prayers, not expecting an immediate or literal answer." (*American Journal of Insanity*, Jan. 1884.)

Hyoscyamine in Insanity.—Dr. D. R. Bower, Chicago, after summarising the literature already published on this subject, records the result of his treatment of three cases of puerperal insanity by means of Merck's crystalline alkaloid in doses of one-thirtieth of a grain. In every case there was a rapid recovery from insanity. One of the patients afterwards died of peritonitis. Dr. Bower says:—"Taking all the facts into consideration, it is not too much strain on probability to claim that, while it has been abused, the drug is not without its place in the armamentarium of the alienist." The writer

states that much confusion is caused by there being two drugs which are indiscriminately spoken of as hyoscyamine. The one is crystalline hyoscyamine, the analogue of atropine. The dose of this substance is one-sixtieth of a grain. The other is the amorphous alkaloid which was the form employed by Dr. Lawson in his early experiments. Of the amorphous alkaloid the dose as quoted by Dr. Bower is from one-eighth to one grain.

The amorphous alkaloid of hyoscyamine is the form generally used in British asylum practice. As now manufactured it is a much stronger and much less variable drug than when it was first used by Dr. Lawson at the West Riding Asylum. From one-sixteenth to one-eighth of a grain of Merck's amorphous hyoscyamine subcutaneously, or from one-eighth to one-quarter of a grain by the mouth, given twice daily, is the practice which is now prevalent in English and Scotch asylums. Ultimately the crystalline may come to be the most acceptable form of the drug. [PRACTITIONER, xxxii., 307.] (*American Journal of Neurology and Psychiatry*, Nov. 1883.)

Two Cases of Temporal Caries.—CASE 1. The patient had suffered from otorrhœa for twelve years. A few days before pain had come on, and when Mr. Sutphen (who reports the cases) was called in, he found him lying upon his right side, breathing stertorously and perspiring, face flushed, pupils contracted, and aphasic when roused. The coma increased, the left facial became paralysed, and the ophthalmoscope showed choked discs. Mr. Sutphen opened the mastoid, and that failing to relieve, drilled a perforation by means of an ordinary trocar through the bone to the cranial cavity, but no pus was found. The autopsy showed an immense abscess, occupying nearly the whole of the anterior and middle lobes of the left hemisphere of the brain. In a depression on the superior surface of the petrous bone, and external to a point corresponding to the eminence for the superior semicircular canal, a circle of dead bone, one-fourth of an inch in diameter, was found. To this the dura mater was attached, and perforated by a small circular ulcer. There was some localised meningitis. The ganglia at base were not involved.

CASE 2. After a continuous discharge for ten years pain came on severely on right side of head, but there was no tenderness or swelling of the mastoid. Vision was impaired in both eyes, and there was parálysis of the right abducens. There was swelling of the disc and retinal venous distension. For three days there were chills, profuse sweating, paroxysmal pain, total loss of vision, twitchings of the limbs, and an inclination to lie on the right side. An incision was made into

the superior wall of the meatus where bare bone was found, and passing through this a "carious passage" was found, and the cranial cavity entered. No pus was found and the patient died the same night. The autopsy showed that there was no accumulation of pus, but there was a partially organised clot occupying the right lateral and superior longitudinal sinuses, with a circumscribed meningitis and incipient softening of the middle lobe. The temporal bone was "extensively carious."

Mr. Sutphen calls attention to the contrast in the chief symptoms of the two cases. With the *cerebral abscess* there was lessening of the discharge, marked changes in the size of the pupil, choked disc, extensive paralysis, early coma, and a rapidly fatal result. With the *thrombosis* there was increased secretion, normal pupil, swollen disc, slight paralysis and tardy termination. In neither was there nausea or vomiting, or swelling of the mastoid region. (*Archives of Otology*, vol. xiii.)

Boro-glyceride in Aural Disease.—Dr. Brandeis gives his experience in the use of boro-glyceride in aural affections. In cases of otorrhœa he uses a solution ranging from 10 to 50 per cent. beginning with the more concentrated solutions, and diminishing their strength as the mucous membrane assumes a healthier condition. For granulations equal parts of a 50 per cent. solution of boro-glyceride and an 85 per cent. solution of alcohol are mixed, and applied in the usual manner. As an artificial drumhead a solution of seventy-five parts of boro-glyceride and twenty-five parts of glycerine was employed. This is a viscid fluid, and becomes adherent to the remnant of the membrane. To keep it in position, a thin layer of collodion is coated over it. This remained in action from three to ten days, when the same procedure was repeated. Dr. Brandeis recommends the preparation as useful in all three cases. (*Archives of Otology*, vol. xiii.)

Herpes and Herpes Zoster.—A number of papers on herpes and herpes zoster have recently appeared. Dr. Paul Fabre has published a volume of two hundred and fifty pages on herpes zoster, in which a very complete abstract of the present state of our knowledge on this subject is given. He gives notes of forty-one cases coming under his personal observation. Fabre defines herpes zoster as "an eruption arranged in patches of various number, shape, and size, separated by intervals of healthy skin, and seated along the course of a nerve." He prefers not to define the eruption, because, as he says, it varies so greatly in different cases and at different periods. He considers the erythematous patch as the essential lesion because it is always present, though vesicles may or may not appear in the course of the disease. Fabre divides

the double zosters into—1, those which are complete and symmetrical, forming a girdle; 2, those which are multiple but not symmetrical; and 3, bifid zoster, when several branches or nerves are simultaneously affected, as when the eruption is found over the scapular region, on the chest, and down the arms. In reality, however, these all proceed from one root. The chief interest of the work lies in the notes of cases reported and referred to, as, for instance, those which go to prove the existence of a lingual and guttural form. Herpes buccalis, labialis, progenitalis, are not included under the head of herpes zoster by Dr. Fabre. Fabre has studied the etiology of zoster very carefully. He shows that it occurs in both sexes and at all periods of life alike. The causes actually known to produce herpes zoster are cold, neuralgia, moral impressions, traumatism, and tumours which may irritate or compress a nerve. As to symptomatology, he goes extensively into this branch of the subject, and gives many interesting cases coming under his own personal observation. In one of Fabre's cases a patient affected with abdominal herpes zoster suffered painful cramps and true clonic convulsions in the sacro-lumbar muscles and in the right anterior portion of the abdomen, while another suffered paralysis of the deltoid, which was ameliorated on the outbreak of the eruption. In adults pain causing insomnia is not infrequent, while in children pain is unusual. Fabre describes three varieties of zoster: 1, the acute febrile form (which has sometimes caused authors to describe zoster as an exanthematic fever); 2, a subacute or apyretic form,—the common variety; 3, a chronic variety, excessively rare, and, in fact, probably a form of recurrent zoster, of which, as is known, only half a dozen examples have been described. Want of space prevents a further *résumé* of this interesting work, a tolerably full analysis of which will be found in the *Annales de Dermatologie et de Syphiligraphie*, vol. iv., 1883, p. 603. Leloir (*Union Méd.*, 1884, p. 1014) describes a form of herpes which he calls "black herpes." His case was that of a pregnant woman who displayed a bluish patch of disease over the left crista ilii, about two or three inches in diameter, accompanied by fever, and which developed into gangrene. The fever lasted through confinement, which took place a few days later and was followed by a copious eruption of blackish herpetic vesicles upon the lips. The fever continued several days,—the patch on the hip meanwhile sloughing,—at the end of which time the patient died in sudden collapse. Leloir considered the herpes in this case as an eruptive fever, and thinks that when the herpetic eruption appears on the lips in pneumonia a similar process is going on in the lung. A curious case of gangrene in connexion with herpes is here called to mind, where herpes phlyctænoides of the

face was accompanied by gangrene of the mucous membrane of the mouth and pharynx (Hallopeau and Tuffier, *Union Méd.*, 1880, p. 956). A similar case, except that the buccal lesions did not go on to gangrene, has recently been reported by an American writer (*Polyclinic*, April 1884). Here a violent attack of herpes of the face was accompanied by herpes of the buccal mucous membrane of the tongue. The fact is that herpes, in spite of the amount of attention it has received, has not yet been studied sufficiently, and there are many mysterious cases of the affection the causation of which remains to be explained. (*Philad. Med. Times*, April 9, 1884.)

Rheumatic Hyperpyrexia.—Dr. A. H. Carter records a case of this kind, in which a good result followed the employment of the graduated cold bath. In discussing the cause of the excessive fever, he points out that it is the changes which take place in the tissues themselves during the process of oxidation which must be regarded as the proximate cause of fever. These changes own some restraining influence, probably they are under the control of the nervous system. Assuming this to be correct, it is easy to understand that central nervous disturbance, characterised by a certain degree of depression, would be attended with the loss and abolition of the controlling influence referred to, and would be followed by unrestrained destructive changes in the tissues, and the production of an excessive amount of heat. This theory receives support from the presence of nervous symptoms in these cases, for delirium and, to a less degree, insomnia and restlessness are always present. As in these cases the delirium often precedes the rise of temperature, it is clear that it cannot be attributed to this cause, and both probably depend upon some functional central nervous disturbance. The occurrence of delirium in rheumatic fever, if not due to some complication, such as pericarditis, should always make us on the look-out for hyperpyrexia. [PRACT. xxxiii. 1.] (*Birmingham Medical Review*, March, 1884.)

Foreign Bodies in the Eye.—Dr. Agnew of New York writes:—"When a patient comes to you complaining of a sensation as if a foreign body were in the eye, you should first examine the eyeball from every point of view. You should then turn over the eyelids and examine their inner surfaces. And here I am reminded of a source of error to which I would call your attention. A few days ago a case came under my observation which illustrates the point. The gentleman had had occasional attacks of conjunctivitis for a year or more. He had then a sensation as if a foreign body were in the eye. On turning out the right lower eyelid, all that was revealed to sight was a slight redness of the conjunctiva. But

there was something in the way in which the sensation of a foreign body in the eye was exaggerated that made me suspect he had a single inverted eyelash. Ordinarily he felt as if some irritant was there which was tolerable, but suddenly there would be a cramp-like action of the eyelid, the irritation would grow rapidly worse, and the eye fill with tears, followed by the discharge of a little mucus, and temporary relief. His beard was of a sandy colour, his hair was light-brown, and his eyelashes were almost colourless. I looked very carefully along the edges of the lids in search of inverted eyelashes, and saw, on the innermost edge of the lower lid, a slight curving of the inner angle. By allowing a tear to gather upon this inner edge, I saw that there was a difference in refraction in different portions of the tear, and it soon became evident that a delicate decolorised eyelash was there, which, instead of growing from the outer edge of the lid, sprang from the free edge of its inner border. I turned the lid over, and found that this delicate eyelash, which was between the edge of the lid and the eyeball, had been so long caught in that position that it had worn a little groove in the edge of the eyelid; the spasmodic action of the orbicularis, from time to time, so long continued, had embedded the eyelash in the substance of the lid. I removed it, and no further trouble was experienced. This patient had been treated in Europe for acute conjunctivitis several times, and it is possible that the eyelash was, on those occasions, the cause of all the trouble. An operation will be required to destroy the follicle which produced the misplaced eyelash. So, when a patient comes to you complaining of a sensation as though there were a foreign body in the eye, between the eyelids and the eyeball, you may first look for conjunctivitis. Whether this be present or not, you should then proceed to examine the eye very carefully to see whether a foreign body be present or not. Scan carefully the whole surface of the cornea and of the scleral conjunctiva, and then turn over the upper eyelid and carefully inspect its inner surface. You may then scrutinise the edges of the lids, as I have described, in order to see whether the source of the irritation be an inverted eyelash." (*American Practitioner*, May, 1884.)

Extracts from British and Foreign Journals.

Nitrite of Sodium.—At a recent meeting of the Société de Biologie, M. Hénocque described some researches on the physiological action of nitrite of sodium. By spectroscopic examination of blood, he found that under the influence of this drug hæmoglobin temporarily lost its power of uniting with sufficient oxygen to convert it into oxyhæmoglobin; in other words, oxidation in a minor degree only is possible. He regards the action as comparable to asphyxia produced by carbonic acid, rather than that resulting from carbonic oxide, since the effect passes off by degrees, and the corpuscles resume their functions in course of time. [In all this, however, he was anticipated by A. Gamgee. *Phil. Trans.* 1868; PRACTITIONER, vol. ii. p. 353.] (*Gazette Hebdomadaire de Paris*, Jan. 4, 1884.)

Treatment of Phagedænic Chancre with Pyrogallic Acid.—M. Vidal, Surgeon to the Hôpital Saint-Louis, has called the attention of the Academy of Medicine to the treatment of phagedænic chancre which he has used for several years. The following are the formulæ usually employed by him: pyrogallic acid one part, vaseline four parts; another, which has given excellent results, is pyrogallic acid and starch each one part, vaseline three parts. For serpiginous sores, with many ramifications, he uses the following: pyrogallic acid one part, powdered starch four parts. This powder is blown into the various parts of the sore by means of a powder-blower; the dressings to be renewed twice a day. Only a fresh preparation should be used, kept in a closely-stoppered bottle. (*Bull. Gén. de Thérap.*, Nov. 30, 1883.)

Improved Method of applying Chrysophanic Acid in Psoriasis.—M. Besnier is at present engaged on a series of experiments regarding the best manner of using Auspitz's method of applying certain substances to the skin in a solution of gutta-percha in chloroform "traumaticine". He has used chrysophanic acid in the treatment of psoriasis by first brushing the patches energetically with a strong brush soaked in a 15 per

cent. solution of chrysophanic acid in chloroform. The duration and energy of the application should vary with the thickness of the psoriatic patch. The application gives rise to a sensation of heat and pricking which is not severe, and soon passes off. In a few seconds the chloroform is evaporated, and the patch being literally infiltrated with pure chrysophanic acid is stained of a deep yellow. Then with a large flat brush "traumaticine" is applied over and beyond the edges of the patch. The result is said to be excellent. The artificial cuticle referred to is made by dissolving one part of purified gutta-percha in ten parts of chloroform. This forms an excellent medium for fixing the application, as it adheres firmly and without alteration for two or three days, or even longer. On comparing it with gelatinous excipients the latter are seen to possess the following disadvantages:—(1) They are liable to be rubbed off by contact with the limbs or clothing, and hence usually necessitate one or two renewals of the application. (2) The gutta-percha compound on the other hand forms a thinner and more delicate cuticle than either collodion or gelatine, producing neither tension nor pain. (3) Its neutral character adapts it as a protective investment to parts however sensitive. Prepared as above, it has never given rise to irritant symptoms, either in children or adults, even when painted over large surfaces. (4) It exerts a more equable pressure than gelatine, the flexible elastic gutta-percha adapting itself better to uneven surfaces. Gelatine forms a brittle coating, so that an addition of glycerine is needed to render it sufficiently pliant, and prevent it from contracting when dried, especially when joints are to be covered. (*Annales de Dermatologie et de Syphiligraphie*, No. 1, vol. v.)

Treatment of Detachment of the Retina.—Dr. Nuttendorf, of New York, describes the treatment he has adopted during the last three years in very severe cases of this affection. He has neither employed new remedies nor new methods, but has combined judiciously modes of treatment which have received the sanction of experience. The indications for treatment are, he considers—(1) To protect the eye as much as possible against all irritating conditions, which can best be effected by closing both eyes or by placing the patient in a dark chamber. (2) To keep the eye as quiet as possible by avoiding all efforts at accommodation, and it should on this account be kept under the influence of a mydriatic. (3) To place the absorbents in as favourable a condition as possible by applying a compressive bandage, and he has found that a caoutchouc band is well adapted for the purpose. (4) To accelerate the absorption of the effused fluid by the use of jaborandi or of pilocarpine. He has employed hypodermic

injection of pilocarpine in the morning and has maintained its effect by the use of an infusion of jaborandi leaves during the remainder of the day. This treatment ought to be continued for three or four weeks, and he has not had any case in which this line was interrupted by the occurrence of any troublesome symptoms. If the detachment of the retina is complicated with specific choroiditis, or if it is followed by the occurrence of serous iritis requiring specific treatment, this may be adopted in addition to the other remedies. In these cases the disease has yielded sooner than in others, and it has not been found necessary to insist on the use of the pilocarpine to the same extent. (*Recueil d'Ophthalmologie*, Jan. 1884.)

Salicylic Acid in Food.—The French Comité Consultatif d'Hygiène Publique has, on two separate occasions, reported against the employment of salicylic acid, even in small quantities, as an agent for the preservation of articles of food. As this conclusion has been much opposed by those interested in such employment, a sub-committee of the body in question has reconsidered the matter, and their reporter, Prof. Brouardel, has published their conclusions in a recent number of the *Annales d'Hygiène*. He observes that, although the beneficial operation of salicylic acid in certain diseases is fully admitted, the theory of its action is very imperfectly understood. It is however known that when introduced into the economy it is eliminated by the kidneys and liver; and its warmest partisans admit that its use is contra-indicated in the subjects of those diseases which prevent its due elimination and thus give rise to an accumulation that in several instances has proved fatal. Moreover, elimination is sometimes impeded from unknown causes in persons in whom the functions of these organs work healthily; while in aged persons it is always very slow. Under any circumstances, only a portion of the salicylic acid is eliminated, the remainder undergoing combinations in the tissues, which, although they may prove therapeutically useful, and even for a time produce no evil consequences, could not be indefinitely prolonged without mischief ensuing. Even small doses of the salicylate may prove dangerous to persons who eliminate it imperfectly; and Prof. Brouardel's investigations during several years past lead him to believe that such persons are largely on the increase. Since 1861 he has analysed the urine of all patients entering his hospital service, and his registers show that the frequency of albuminuria has more than doubled during the last twenty years. Now, these patients are not all condemned to an early death, for many recover, and others live for many years; and when examples are adduced of young and robust persons tolerating the daily use of from four to six.

grammes of the salicylates for months or years, we must not forget the aged persons and albuminurics, and individuals the subjects of various kinds of hepatic and renal disease, whose lives might be seriously compromised by such a regimen. The committee, therefore, believing that for such persons the daily use of salicylic acid would be highly dangerous, while even for those in good health there is no proof that it would be innocuous, recommend that its present prohibition should be maintained. (*Med. Times*, Feb. 16, 1884.)

Test for Impurity of Iodoform.—The examination of iodoform for impurities is conducted, according to the method of Agema, as follows. Iodoform is shaken with distilled water, and the solution filtered, and to it is added an alcoholic solution of silver nitrate (lunar caustic). The mixture is now set aside for twenty-four hours. Should foreign substances be present in the water, there will be a black precipitate of reduced silver in proportion to the amount of the impurity. Pure iodoform will give by this test only a faint greyish cloud upon the bottom of the glass. All the preparations which had caused toxic symptoms gave a precipitate when tested by this method. (*Centralblatt für Chirurgie*, No. 48, 1883.)

Uses of Quebracho.—In a recent lecture, Professor Da Costa says that he has found this drug especially serviceable in two classes of cases:—(1) In purely nervous asthma he had found it invaluable; (2) he had also known it to be very useful in cases which have been rather loosely called cardiac asthma—cases in which a heart-lesion has produced failure of cardiac contraction and consequent congestion of the lung. He prescribes it in twenty-minim doses of the fluid extract every hour, gradually increasing the amount—some patients requiring as much as a drachm before relief is obtained. The good effects are usually observed after two or three doses have been taken; as the respiratory symptoms are relieved, the remedy may be given at longer intervals. The taste is well covered by using as the vehicle equal parts of the French syrup of red orange and water. (*Boston Med. and Surg. Journ.*, Dec. 27, 1883.)

An Antiseptic Post-partum Pad.—Dr. J. H. Garrigues recommends the following:—After removal of the secundines, the patient is washed with a warm corrosive sublimate solution (1 in 2,000), and a piece of lint, six inches by eight inches, folded once, so as to be three inches wide, is placed over the vulva; outside this, a piece of oiled muslin nine inches by four inches; over that, a large pad of oakum; and finally the whole is fastened to the binder by a piece of muslin eighteen inches square, folded together so as to form a kind of boat, five inches

wide, and pinned in front and behind at each of its corners. This dressing is renewed four times in the twenty-four hours, and at the same time the genitals are washed with the sublimate solution. (*New York Medical Journal,* Dec. 29, 1883.)

Some Improved Oleates.—Dr. James Sawyer writes:—About twelve months ago I bore testimony to the therapeutic advantages of certain new oleates, made according to the formulæ of Dr. Shoemaker of Philadelphia (*Brit. Med. Journal,* Feb. 10, 1883). In a paper on the preparation and uses of oleates, read by Dr. Shoemaker before the Medical Society of Pennsylvania, that well-known American dermatologist pointed out the use of chemically true oleates, in contradistinction to those previously prepared by the direct union of oleic acid with a metallic base, with or without the aid of heat. The new oleates are obtained by the double decomposition of sodium oleate with solutions of neutral salts, the sodium oleate being prepared by the saponification of oleic acid with a solution of sodium-hydrate. A solution of the sodium oleate in eight parts of water is precipitated by a neutral salt, and the precipitate, washed and dried, is the oleate required. Messrs. Southall have prepared various oleates according to Dr. Shoemaker's methods, and some of these, namely, the precipitated oleates of lead, zinc, and copper, I have examined and tested extensively in private and hospital practice. Compared with the older preparations, the new oleates present the great advantage that they can be used as dusting powders as well as in the form of ointments, so that their remedial virtues are available in those affections of the skin in which greasy applications do not "agree." It is well known to the profession that medicaments applied as dusting powders are preferable to ointments in many of the acuter forms of discharging affections of the skin. Zinc oleate is a fine pearl-coloured powder, with a peculiar soft, soapy feel, like powdered French chalk. Lead oleate is a white coloured powder. Either of these oleates may be used alone as a dusting powder for the skin, or they may be so used when diluted with powdered starch. One drachm, or a drachm and a half of oleate of zinc or of oleate of lead, mixed with an ounce of petroleum jelly, or with benzoated lard, makes a good ointment, which I have found efficient in a large number of cases of eczema, in various stages. When a soothing effect is desired, the lead oleate is to be preferred; when an astringent is indicated, the zinc oleate should be chosen. Dr. Shoemaker has introduced oleate of copper as a remedy for ringworm. I have used it in the form of an ointment, of the strength of one drachm and a half of the oleate to six drachms and a half of petroleum jelly, in some mild cases of ringworm, with excellent

result. Oleate of zinc, used as a dusting powder to the skin, is a good remedy in cases of excessive sweating. When used for this purpose, the addition of a little thymol to the oleate, in the proportion of one grain to an ounce, as suggested by my friend Dr. Murrell, is an improvement. Increased experience in the use of various oleates has led me to regard them as taking a high place amongst our best local remedies for many cutaneous disorders. (*Birmingham Med. Review,* Feb. 1884.)

The Action of Chloroform on the Medulla.—M. Laborde has recently examined the action of chloroform when subcutaneously injected. He concludes that it causes death by producing congestion of the medulla oblongata especially at the roots of the vagi. This condition leads to albuminuria, which is characteristic of chloroform-narcosis, as shown by himself and M. Bouchard, and to paralysis of the vagi with consequent emphysema and engorgement of the lungs as seen after section of those nerves, as well as in death from chloroform-inhalation. (*Progrès Médical,* May 3, 1884.)

The Action of Kairin on the Blood.—M. Loyd has recently published certain researches on the action of kairin on the blood, which tend to explain its antithermic action as well as certain toxic symptoms which have resulted from its over-use. He finds that this drug reduces the absorption of gases by the blood, particularly of oxygen. Thus, the blood of a dog which in its normal state yielded CO_2 36 ccm., O 14 ccm., N 1·5 ccm., gave after injection of a gramme and a half of kairin, CO_2 21·9 ccm., O 3·6 ccm., N 1·5 ccm. In other similar experiments the spectroscope showed attenuation and disappearance of the bands of oxyhæmoglobin. These observations show why cyanosis and other kindred phenomena sometimes occur in the therapeutic administration of this remedy, and impair its value in typhoid and other fevers which tend in a marked degree to destroy the blood-corpuscles. M. Quinquaud, in investigating the same subject has found that the amount of gas in the blood is not affected by small, though it is by large, doses. He has also, by careful manipulation, been able to identify one absorption-band in the spectrum as always present whenever kairin has been injected. (*Progrès Médical,* May 10, 1884.)

New Mode of Treatment of Ulcers of the Cornea.—Dr. Hermann Kuhnt, the Professor of Ophthalmic Surgery in Jena, proposes a new method of treatment of corneal ulcers which is deserving of trial. He remarks in a short essay he has written upon the subject that certain forms of ulcer of the cornea have a strong disposition to penetrate this tissue; and

that these forms are especially liable to occur in those who are ill-nourished and who are the subjects of tuberculosis, syphilis, and diabetes. He noticed in one instance that a penetrating ulcer was situated opposite the fissure of the lids, and it occurred to him that this position was eminently favourable for the deposit of various atmospheric germs on its surface. He was led to devise some means for protecting the raw surface, and none appeared more appropriate than the transposition of a flap of the conjunctiva. Experiment satisfied him of the applicability of this method; and he accordingly recommends that after the surface of the corneal ulcer has been thoroughly disinfected by appropriate means, a conjunctival flap should be carefully made parallel with the edge of the cornea, and that this should be so twisted as to cover the ulcer. The result is rapid recovery of the ulcer, while the transplanted portion of conjunctiva, after fulfilling its purpose, soon wastes away. (*Pamphlet*, Wiesbaden, 1884.)

The Position of Reissner's Membrane in the Human Cochlea.—Mr. Steinbrügge relates a case in which he found that Reissner's membrane did not pass in a straight line to the outer wall of the ductus cochleäris formed by the ligamentum spirale, but rested on the membrana tectoria, covered Corti's organ, and then gradually passed upwards to its point of attachment. Led by this specimen to examine all the vertical sections of the cochlea at his disposal, he found that this position of the membrane "is not very rarely found in the cochlea of the human adult." Usually the membrane is described as passing in a straight line and at an angle of 45°; but Hensen has also found a relaxation of the membrane, and its angle from the crista spiralis as 15°, which approaches that found by Steinbrügge. As to the elasticity of the membrane Mr. Steinbrügge inclines to allow that it has that property, and that it acts as a safety-valve by preventing too great a pressure on the endolymphic space, the necessity for the avoidance of which is apparent, "if we remember that any increase in it will change the tension of the cord of the zona pectinata, and thereby alter its pitch." (*Archives of Otology*, vol. xiii.)

The Measurement of the Foot as an Index to the Size of the Child.—One main difficulty in the attainment of precision in the determination of the most suitable method of delivery in difficult labour, is that we have no means of exactly estimating, before attempting delivery, the size of the fœtal head. We can measure the pelvis but not the head; one factor, therefore, of the mechanical problem, is an undetermined

quantity. A recent number of the *Zeitschrift für Geburtshülfe und Gynäkologie* contains a paper by Dr. Alfred Gönner, of Basle, in which he has made an attempt to overcome this difficulty, so far as head last cases are concerned. His plan is to measure the foot, and from this datum to estimate the size of the child, and, therefore, of the head. He points out that the measurement of the foot is one easily made, and, therefore, that his method has in this respect the advantage over the other modes in which it has been proposed to estimate the size of the child, such as measuring its length, and measuring the distance between the fontanelles. Dr. Gönner has measured and weighed 100 children. He comes to this conclusion, that if the foot measures more than 8 centimetres (nearly $3\frac{1}{2}$ inches) in length, the child weighs more than 3,000 grammes (about 6 lb. 10 oz.). A foot more than $3\frac{1}{2}$ inches long, therefore, makes it probable that the child is above the average weight, and that there will be more than usual difficulty in the extraction of the head. If the foot be only 7·6 centimetres (about 3 inches) long, a child of moderate dimensions may be expected; and a foot length of only 7·3 centimetres (a little more than 2 inches) would justify us in assuming that the child was premature. It is interesting to note also, that Dr. Gönner finds that the feet of female children are smaller in proportion to the size of the body than those of males. He suggests that the children of the educated classes will probably have relatively smaller feet than those of the labouring classes, but his own field of observation has not supplied him with the materials for testing this point. (*Med. Times*, May 24, 1884.)

Rectal Etherisation.—Dr. Mollière has tried this method at the suggestion of Dr. Axel Yversen, of Copenhagen, and a note published in the *Lyon Médical* (April 1884), shows that it is well worthy of a trial. In the first case, that of a woman aged 20, ether was thrown into the rectum by means of Richardson's apparatus; in five other cases, an india-rubber tube of the size of the finger was introduced into the rectum and put in communication with a bottle containing ether; the bottle was placed in warm water (50° C.), and the vapour of ether gradually passed into the rectum. Whenever the tension of the vapour reached a certain point, part of it escaped through the anus. After five to ten minutes, the patient complained of drowsiness and of a taste of ether in the mouth. Complete anæsthesia could be produced in this way, but it was generally found advisable to let the patient inhale a few grammes of ether. A very small quantity is sufficient, and there seems to be no period of excitement; another advantage is that full play is given to the surgeon when operating on the face. (*London Medical Record*, May 1884.)

Dr. R. F. Weir (*New York Med. Record*, May 3) operated upon a robust child aged eight months for hare-lip, ether being given by rectum. The child was fully etherised in three minutes; the amount of ether used during the operation was less than two ounces. The child was somewhat depressed after the operation, but rallied under hot applications, &c. During the night it had several large and bloody passages, and died in the morning.

Dr. Wm. T. Bull (*New York Med. Record*, May 3), in his report of seventeen cases of etherisation per rectum, all of whom were adults, says in reference to the bloody stools which occurred in seven of his patients: "In even smaller quantities than any of my patients have absorbed, it might, in young or enfeebled persons, produce death from diarrhœa and collapse."

The rapidity with which ether is absorbed from the rectum is remarkable, some patients tasting it within two minutes after the introduction of the rectal tube. The general anæsthetic effect is not so rapidly produced, but the administration is much less annoying to patients, while they recover more speedily than after ordinary etherisation, and manifest less subsequent excitement. The new method is neither applicable nor necessary in prolonged operations. Even in those upon the face and throat, anæsthesia by the rectal tube need only be alternated with that by the cone in a large range of cases. Indeed, in all severe and prolonged operations upon the face, a hypodermic injection of 8 or 10 minims of Magendie's solution of morphine, given a few minutes before cone-etherisation is commenced, is sufficient, in a large majority of cases, not only to tide over the intervals when the mouth must be free, but to enable the operator to dispense with the ether altogether for varying periods. In most nervous persons, it may be found advantageous to commence etherisation by the rectum until unconsciousness is produced, when the anæsthetic effect can be maintained by the cone with the usual surety and safety. But, as we have already remarked, the range of applicability of the rectal method must be determined by time and experience. (*Med. Times*, June 7, 1884.)

Two Surgical Follies.—Under the somewhat sensational title of "Seven Surgical Follies," Dr. John B. Roberts (*Polyclinic*, February 15) considers what he calls the ether folly (the abandonment of ether for chloroform on account of lack of knowledge of how to secure anæsthesia by the former), the incision folly (too short incision), the styptic folly (use of styptics to control hæmorrhage), the adhesive plaster folly (plaster in the place of sutures), the dose folly (inadequately small doses), the sponge folly, and the suture folly. On these last two points he says:—"What I term the sponge folly is the

habit of employing sponges for absorbing blood from wounds, when napkins or towels are always obtainable, and are far less liable to introduce septic material into the wound. Sponges, while too expensive to be thrown away after each operation, are cleaned with great difficulty. Servants and nurses, therefore, not appreciating the importance of thorough cleansing and disinfection, often neglect this duty. Hence I prefer towels, and if I do an operation in a patient's house, always use clean towels obtained there. Thus I secure an almost certain immunity from purulent or septic dirt in the articles used for absorbing blood. Perfectly clean surgical sponges are the exception, but clean household towels are the rule. At the Polyclinic I use for this purpose, to a considerable extent, Japanese paper napkins, which are thrown away after being once used. Absorbent cotton is too expensive for such uses, except to a limited extent, and besides, has a tendency to leave filaments entangled in the wound."[1] Regarding the "suture folly," the author says:—"I do not refer to the erroneous opinion, long held, that sutures should not be used in the scalp. This tradition has been disproved so often that few surgeons would now hesitate to use sutures as freely in the scalp as elsewhere. What I call the suture folly is the adherence of many to the theory that silver wire only should be employed for suturing purposes. Nothing could be more fallacious. Do we use silver hare-lip or acupressure pins? Why, then, employ silver sutures, when iron wire is stronger and far cheaper? When large and gaping wounds require the sutures to stand much tension, silver wire, if used, must be very thick. Iron wire of much smaller diameter, and therefore much more flexible, gives an equally strong suture, and in addition to being better adapted to the purpose, is much cheaper. I recollect that, in hospital practice, nearly eight years ago, I discarded silver wire, which cost one dollar for each small coil, and bought, at a hardware store enough iron wire for ten or fifteen cents to last many months. The nicest iron wire I have seen, and which I now use for the purpose, because it is strong, very flexible, and free from elasticity, can be

[1] We learn by a note in another part of the same journal that these Japanese napkins are found by Dr. Roberts as efficacious and clean as cotton ones, and are so cheap that they can be thrown away after being used. They cost from $6 to $7·50 a thousand. The cost of washing a large number of ordinary towels is thus avoided. The paper towels are scarcely suitable for drying hands after washing, unless several towels are used at once, because the large amount of moisture on the hands soon saturates a single towel. For removing blood from wounds, a paper towel is crumpled up into a sort of ball and then used as a sponge. Such balls absorb blood rapidly. The crude ornamental pictures, in colour, on the towels, are of no advantage, nor are they, as far as is known, any objection.

brought for five cents a spool. If it becomes a little rusty, it can be rubbed clean in a moment should the operator object to the small amount of oxide of iron upon it." (*Boston Med. and Surg. Journ.*, April 3, 1884.)

Veratria in the Pruritus of Women.—All acquainted with the incessant suffering which some women undergo from pruritus at the period of the menopause, must be very desirous of being made acquainted with a prompt remedy for so distressing an affection. Whether it arise from the presence of prurigo, urticaria, eczema, herpes, or whether it exist without any eruption at all, it is alike difficult to allay, as the great number of remedies which have been proposed testifies. Of these veratria is by far the most efficacious. When the pruritus is localised at the groins, arm-pits, walls of the abdomen, or behind the ears, gentle friction night and morning with an ointment, consisting of thirty parts of lard and a quarter of a part of veratria, usually gives relief. When the pruritus is generalised, the internal administration of the veratria is preferable. Two centigrammes should be made into ten pills with liquorice powder, of which from two to six should be taken daily, either half an hour before, or three hours after, meals. Only one should be taken at a time, an additional one being given each successive day until the maximum of six (three milligrammes) is attained. (*Progrès Médical*, February 23, 1884.)

Skin-Grafting.—The material which is removed from the sides of a ruptured perinæum, when they are vivified preparatory to uniting them, makes the best skin-grafts to be obtained from any source. Being half skin and half mucous membrane, they are peculiarly adapted to the purpose; and a far larger proportion of the grafts will "take" when this material is used. (*New York Medical Journal*, Jan. 19, 1884.)

Lotion in Severe Contusions.—Dr. Hewson, who resides in a town of Texas where accidents from saw-mills and lumber-works are frequent, communicates the formula of a lotion which he says he has found of great utility in treating the severest contusions:—

℞ Sodæ Hyposulphit. ℥iv,
Acid Carbol. Cryst. ℥ss,
Glycerini, ℥ij,
Aquæ Oj.

A cloth well saturated in the solution to be kept constantly applied to the part. (*Philadelphia Medical News*, Feb. 23, 1884.)

Bibliography.

Études sur la Pathologie du Rein. By Profs. Cornil and Brault. 8vo, pp. 308, illustrated. 12*s.* Paris. 1884.

Die nervösen Magenkrankheiten. By Dr. Berth. Stiller. 8vo, pp. 202. 6*s.* Stuttgart: Enke. 1884.

Lectures on the Diseases of Infancy and Childhood. By Charles West, M.D., &c. Seventh Edition, revised and enlarged. 8vo, pp. 896. London: Longmans, Green, and Co. 1884.

Regional Surgery, including Surgical Diagnosis: a Manual for the use of Students. Part II., The Upper Extremity and Thorax. By F. A. Southam, M.A., M.B., F.R.C.S., &c. Sm. 8vo, pp. 582. London: Churchill. 1884.

Manual of Diseases of the Ear, for the use of Students and Practitioners of Medicine. By Thomas Barr, M.D., Surgeon to Glasgow Hospital for Diseases of the Ear, &c. Crown 8vo, pp. 520, with 115 Wood Engravings. 10*s.* 6*d.* Glasgow: Maclehose. London: Macmillan. 1884.

Manual of Pathological Histology. By Cornil and Ranvier. Second Edition, re-edited, enlarged, and translated by A. M. Hart. Vol. II., Lesions of the Organs, Part I. Demy 8vo, with 125 Illustrations. 12*s.* London: Smith, Elder and Co. 1884.

Hay Fever; its Etiology and Treatment. By Dr. Morell Mackenzie. Royal 8vo, pp. 24. 1*s.* London: Churchill. 1884.

On the Sulphur and Chalybeate Waters of Strathpeffer Spa in the Scottish Highlands. Fifth Edition. By Dr. D. Manson. Cr. 8vo, pp. 106. 1*s.* London: Churchill. 1884.

The Treatment of Backward Displacements of the Uterus and of Prolapsus Uteri, by the New Method of shortening the Round Ligaments. By Dr. W. Alexander. Cr. 8vo, pp. 71. 3*s.* 6*d.* London: Churchill. 1884.

*** Any of the foreign works may be procured on application to Messrs. DULAU, of Soho Square, W.C.; WILLIAMS and NORGATE, of Henrietta Street, Covent Garden, W.C.; or BAILLIÈRE, of King William Street, Charing Cross.

Department of Public Health.

THE TWELFTH ANNUAL REPORT OF THE MEDICAL OFFICER OF THE LOCAL GOVERNMENT BOARD.[1]

First Notice.

Dr. Buchanan's Annual Report for the year 1882 opens with an account of several matters which are of importance in connexion with the question of public vaccination, the appendix containing special reports dealing with the same subject.

After recalling the fact, shown in a previous report, that the system of vaccination as carried out in London saved the lives of some 12,000 children, who would otherwise have been sacrificed to small-pox during the epidemic which occurred in the metropolis in 1881, reference is made to the circumstance that in some way or another twelve deaths were regarded as having been caused by erysipelas or some allied affection during the same period as the result of vaccination, and some account is given of the enquiries which were held at Derby and at Norwich into deaths alleged to have been so brought about. The only medical interest attaching to these enquiries relates to the circumstance that in both instances the operation of vaccination was carried out under circumstances which can only be regarded as negligent, and with a view of providing against any such recurrences in the future it has been deemed advisable to introduce one other formal instruction into the code under which public vaccinators act, and which should also be applied by all private practitioners to their vaccination work. The new rule is designed to prevent the

[1] Supplement by the Medical Officer to the *Twelfth Annual Report of the Local Government Board* for 1882 [c.—3778—I.].

accidental inoculation of any trace of septic matter, by enjoining that the vaccinator should never use a point, glass, or tube a *second time*, either for the conveyance or the storage of lymph.

Certain experiments which were carried out by the chief vaccinator attached to the National Vaccine Establishment are next considered. The official in question was desirous of testing the current belief that vaccine lymph taken from a syphilitic person, if unmixed with the blood of the vaccinifer, does not contain the syphilitic virus, and is hence incapable of imparting syphilis by its inoculation. These experiments could only be carried out on his own person, and with true scientific devotion he set himself to work. The appendix to the report gives a full account of all the experiments practised; the paper in which the matter is dealt with being prepared by Drs. Bristowe, Humphry, and Ballard, and Mr. Jonathan Hutchinson. It will be unnecessary for our present purpose to give an account of each experiment; indeed all but the last one can be passed by with the explanation that children who were obviously syphilitic were selected as the vaccinifers, that in two cases they presented active symptoms of syphilis, and that, notwithstanding this, the ordinary precaution to avoid admixture of blood led to no transmission of the disease in connexion with the vaccinations which were effected. The last experiment was performed on July 6th, 1881. The vaccinifer was a female infant eighty-four days old. Ten days after birth she began to have "snuffles." When about four weeks of age an eruption appeared upon the arms, and this remained at the time when her lymph was used. There was also a sore upon the right buttock and one in the left nostril. The vesicles which had resulted from the child's vaccination were normal in appearance and not inflamed. The immediate neighbourhood of the vesicles was free from eruption. Lymph was carefully taken, and the vaccination was performed in three places, but the operation was unsuccessful and no pock arose. But on the twenty-first day there was at two of the vaccinated places redness and a small papule. These papules grew rapidly. One soon exhibited an ulcer, and at this stage Dr. Humphry and Mr. Jonathan Hutchinson were consulted; both agreed that the spots were syphilitic, and with Mr. Hutchinson's reluctant concurrence they were both excised on the 11th August, the incisions uniting on

the following day. But on the 14th one of the places was a little inflamed, on the 17th a gland in the axilla was tender; next day one of the wounds was distinctly inflamed and indurated, and there was a good deal of axillary pain. Towards the end of the month the throat was sore, the glands of the neck were painful, a roseolar rash appeared on the forehead, temples, back of the neck, and below the ears, and anti-syphilitic treatment was fully commenced. Referring to the experiments as carried out by the officer in question, the reporters then sum up as follows:—

"1. He has stated to us that the object he had in view in instituting these experiments upon his own person was to test a current belief that vaccine lymph taken from a syphilitic person, if unmixed with the blood of the vaccinifer, does not contain the syphilitic virus, and is incapable of imparting syphilis by its inoculation. Having acquired syphilis at his last experiment, he had (apart from any question of vaccination) a second object in having the primary lesions excised, namely, to examine microscopically the excised parts, and to ascertain whether the excision would prevent constitutional disease or modify its course. It was further in order to give this second experiment fair scope that he abstained from submitting himself to antisyphilitic treatment, until the signs of constitutional syphilis had become so clear that doubt of the failure of excision as a preventive measure could no longer be entertained.

"2. It is conclusively proved by his experiments that it is possible for syphilis to be communicated in vaccination from a vaccine vesicle on a syphilitic person, notwithstanding that the operation be performed with the utmost care to avoid the admixture with blood.

"3. It is to be remarked that the infants from whom he took lymph for his personal vaccination were, in all cases but one, not suffering from hereditary syphilis in a *latent* form, but were infants in whom *active* symptoms were unmistakably present, as shown by cutaneous eruption, snuffles, mucous tubercles, and ulcerations.

"4. Moreover, out of the four children thus used, only one was proved to have been capable of imparting syphilis by the lymph taken from its vaccine vesicle.

"This case is in conformity with general experience in the following respects, among others; namely, that when syphilis is communicated by inoculation, the first appearance of the disease is at the seat of inoculation, the taint of the blood being in all cases preceded by a conspicuous, peculiar and persistent manifestation of disease at the seat of inoculation.

"6. The infants from whom he took lymph for his experiments on his own person were in such a condition of obvious syphilitic disease as would certainly have precluded their use as vaccinifers by even an inconsiderate and reckless vaccinator. Indeed they were selected by him for his self-vaccination because they were unquestionable syphilitic cases. It is a rule of practice in the profession not to use in vaccination lymph taken from a child in whom there is any suspicion whatever of syphilitic taint, or indeed in whom there is any skin disease although of a character known to be harmless; and the observance of this professional rule is strictly enjoined by the Local Government Board in its instructions to public vaccinators through the country."

Perhaps the point of greatest interest in connexion with these experiments has reference to their relation to the practice of vaccination as carried out in this country. As to this, Dr. Buchanan points out that quite apart from the question of the transmission of syphilis by vaccination it has been the practice of English vaccinators to avoid using any syphilitic children as vaccinifers, and the long-continued absence of any authenticated case of syphilisation as the result of vaccination in this country, led many to doubt whether such a result was ever possible. In order to attain success in the course of experiments to which we have adverted, it was necessary deliberately and intentionally to break through an invariable rule of practice which all medical practitioners observe, and to repeat the experiment again and again in the face of repeated failures. So far as public vaccinators are concerned they are bound by the instruction:—"Take lymph only from subjects who are in good health . . . . and always carefully examine the subject as to any existing skin disease, and especially as to any signs of hereditary syphilis," and Dr. Buchanan comes to the conclusion that the observance of this rule offers all the safeguard needed, and that syphilis can only be imparted by a vaccinator in such a manner as no medical

practitioner is likely by any accident or carelessness to imitate.

Amongst the reports of the inspectors of the Medical Department of the Local Government Board which are appended to that of the Medical Officer, several deal with matters of considerable interest. One of these is by Mr. Power on an outbreak of scarlatina which occurred in the metropolis, and in which the infection could be clearly shown to have been conveyed by means of milk. But the history of this milk could be traced with a good deal of assurance, from its leaving the cow in Surrey to its delivery in London, and yet no means by which the scarlatinal infection could have reached it could be discovered. At this stage Mr. Power, taking the Surrey dairy farmer into his confidence, got him to consider with him whether *any new condition* could have entered into his business about the date when the milk must have received its power to communicate disease. It then appeared that one of his cows having calved, had come into milking three or four days after that occurrence, and that the outbreak had suddenly appeared some four days after the milk again came into use. It also appeared that this calving constituted the sole new element introduced into the milk business, and that, apart from the cow exhibiting, many weeks later, much staining of the buttocks and posterior udder from excremental matter, and probably also from vaginal discharge, the animal did not appear to have especially suffered as the result of calving. Mr. Power having arrived at this stage frankly admits that he may have failed to discover some evidence that would at once explain the occurrence of the scarlet fever through some ordinary channel, but he considers that because of the possibility of such failure he is not justified in overlooking certain positive indications which arise as soon as there is seen to be probability that the milk was infected when it left the animal. Few physicians, as he points out, will be disposed to deny a relation between scarlatina and certain forms of febrile puerperal disease among women; and if one sort of relation between scarlatina and accidents of the puerperal state be admitted, another sort of relation becomes comparatively easy of belief, whilst there would be nothing improbable in the further suggestion that all such relations

would be qualified by the passage of a common contagion through the system of another animal. At this point Mr. Power's own words will best explain the line of thought he adopts:—

"Thus considered, the outcome of my enquiries at this Surrey farm may be not without significance. If scarlatina in man have other animal source than human source, it may be that one such source is the cow that has recently calved, a cow either not at all ill (except for her parturition), or not so obviously ill as to prevent her milk being used for human consumption. Milk of a recently-delivered cow might become infective in more than one way. Either it might, as a secretion of the cow, contain infective matter that was circulating in the system of the cow; or else uterine and other discharges of the cow fouling her udder, might, by a careless milker, be mixed with her milk in the act of milking. For the purpose of testing the question here raised by experiment on animals other than man, all that is required is, first, a healthy cow that has recently calved, and then a succession of cows suffering under one and another recorded ailment, special to the period after calving. Milk from such cows, on the one hand unsophisticated as it came from the udder, on the other hand mixed with one and another kind of vaginal discharge of the cow, could be used for feeding as well perhaps for throat inoculation of some lower animals, and among these young pigs would seem to be promising subjects.

"In conclusion I would advert briefly to some facts which seem worthy of further consideration in this connexion.

"1. In epidemic outbreaks, referred to milk as their cause, infectivity of the milk has commonly lasted a short while only. In most instances a week or ten days would comprise nearly the whole period during which the implicated milk can be believed to have done mischief. This circumstance accords with some cow-condition as the cause of the milk infection quite as well as, perhaps better than, with any other suggested cause. For instance, and from our present view-point, a recently-delivered cow would not be long ill, and certainly her uterine discharge would not be expected to continue many days.

"2. Epidemic outbreaks among human communities that have been traced to milk as their cause, have generally occurred in relation with cow-businesses that have had to do with the

production of milk and milk alone. Such businesses do not manufacture butter or cheese, nor do they rear calves. Consequently their cows are apt, after having calved, to come almost at once into business use, even though they may have some trivial (in the opinion of those about the cow) ailment, not obviously affecting the quantity or quality of the milk rendered by the cow.

"3. In the case of scarlatina, outbreaks due to milk have commonly been characterised by small mortality as well as by mildness of the disease induced. In many such outbreaks, and notably it was the case in the present instance, a considerable proportion of the sufferers have only had sore throat of little severity; and further, this milk-scarlatina has on this, as on other occasions, been little prone to spread to other persons. These facts, insignificant mortality of the disease induced, its mildness, its tendency to remain localised in the throat, and its small ability to extend itself to persons in relation with the sick people, may be thought of as not inconsistent with an infective cause, having (as in vaccinia) an animal, but not recently a human, origin."

With a view to the discovery of any such relationship between human scarlatina and bovine disease, Dr. Klein made certain experiments to ascertain (1) Whether the lochial discharges of a reputedly healthy cow would, when inoculated into, or administered along with food to certain animals, produce in them any obvious illness; and (2) whether any form of illness might be producible in a cow by inoculating and feeding the animal with scarlatinal matter derived from a human source. As the result of the experiments carried out by Dr. Klein he found that a cow having recently calved, when inoculated with human scarlatina, is affected by an ailment which is transmissible after the manner of an acute specific disease, and with a definite period of incubation to dogs, but that this ailment does not obviously affect the cow's health or her milk. The experiments as yet are by no means complete, but the question of relationship between human diseases and those of the lower animals is one of such great importance that we trust occasion may be found for pursuing it further.

One of the later contributions to the report is a memorandum

by Dr. Burdon Sanderson on lines of research concerning infection and disinfection, which is intended as an introductory chapter to a further report into the behaviour of some of the better known contagia in presence of various colytic agents. Mr. Simon, as we are reminded, divided contagia into two classes, namely, (1) those of which "man's body is the sole birth-place," and which "we see in case after case multiplying their respective types with a successivity as definite and identical as that of the highest orders of animal and vegetable life;" and (2) those which "confess a birth-place exterior to man, a birth-place amid controllable conditions in the physical nature which is around us, a birth-place amid the common putrefactive changes of dead organic matter." Now both these, it is pointed out, have intimate relations with filth. "It is in filth that the innate contagia find the conditions necessary for their continued life outside the living body," whereas those "which originate in diseased tissue are brought into relation with their filth environment only after their escape from their birth-place." True disinfection applied to filth means its destruction, and since this cannot well be effected as regards indefinite quantities in indefinite spaces, it comes to this, that the scope of disinfection must as yet be limited to action applied to the matters discharged by individual cases of infectious disease, whether these be in the liquid or solid excreta, or suspended in the air.

Dr. Burdon Sanderson points out that the innate, no less than the extraneous contagia, have a life history which is made up of two states of existence, alternating with, or succeeding each other—one in which they vegetate more or less actively in the external environment, the other in which they have their abode in living blood or tissue, and there exercise their hurtful function; and the problem of disinfection relates as closely to the latter as to the former of these states. As regards the need for attacking contagia as they are leaving the organism with which they are in relation, he reminds the reader of the evidence which has been obtained as to the tuberculisation of animals in rooms inhabited by consumptive persons, and how this suggests the possibility of danger from the collection of such persons in numbers under one roof, as is the case in consumptive hospitals.

He also adverts to the experience which Mr. Power gained as to the diffusion of small-pox aërially around the Fulham Hospital, an experience which led Dr. Sanderson to suggest that small-pox hospitals might with advantage be so constructed as to ensure the destruction of all living particles discharged from the bodies of the sick before the ward air was allowed to mingle with the external atmosphere. There remains the question of dealing effectually with contagia as they enter the living organism, or of so dealing with them during their development within the organism as to render them harmless, and he points out that the first step in the investigation appears to be the acquirement of better knowledge as to the arrest and inhibition of contagious action within the body. As yet, though we can oppose the development of malarious fever by quinine, or that of rheumatic fever by salicylic acid, we cannot prevent a person who has taken such a poison as rabies from having hydrophobia, and our knowledge of the action of contagia and of the specific differences between them, is so incomplete that it is at present impossible to say whether the discovery of specific colytics is likely to be realised. The two directions in which investigations should be in the first instance made, are, first the detection of contagia in food, air, or water, which is about to enter the organism; and secondly, the use of colytic agents with a view to the inhibition of infective action within the living body. No attempt has yet been made to destroy infective matter contained in large volumes of air, and as regards examinations of water, they do not yet help us to discriminate "between living and non-living, much less between active and inert, between hurtful and innocuous."

Dr. Sanderson next adverts to the analogies existing between the common septic and the specific infections, and he goes on to say that "in the successive evolution of contagia it can scarcely be doubted that the septic infection which is dependent on conditions which are relatively so simple must have preceded the rest in time, in other words, that all contagious microphytes are related by descent to the "common microphyte" of sepsis, and consequently that "whatever properties belong to the parent are likely to be represented, more or less modified, in those of the successors." And he proceeds to point out that the

development of microphytes in an albuminous fluid undergoing sepsis at a favourable temperature is a terminable process; that after the culmination of the process the organisms cease to multiply and eventually die; that this takes place before the whole of the proteid matter is used up, and hence cannot be due to want of nutriment; and that there is good reason for regarding this result as due to the coming into existence of chemical bodies belonging to the aromatic group, which are represented at an early stage in the septic process by acids of the acetic series. One of these acids has been found by experiment to be destructive of the vitality of microphytes in a degree which is twenty times greater than that in which carbolic acid acts. In this direction an effort will doubtless be made to acquire knowledge as to the action and counter-action of septic ferments and their antagonists when opposed to each other in the presence of the living protoplasm of the living body, and then, applying the doctrine of evolution to pathology, to endeavour to extend that knowledge to the specific contagia, "with a view to the eventual discovery of specific antagonists to them." Sustained researches are promised in this direction.

FURTHER REPORTS OF THE GERMAN CHOLERA COMMISSION.

In a former article dealing with the reports prepared by the German Cholera Commission, brief reference was made at p. 230 (vol. xxxii.) to the fifth report which had been transmitted from Calcutta on January 7th, 1884. In continuation of that article we now proceed to consider that report and the subsequent ones which bring to a conclusion the account given by Dr. Koch of the labours of the commission in Calcutta.

In his fifth report, Dr. Koch commences by acknowledging the assistance he has received from the authorities in Calcutta, and by recording the fact that amongst the cholera bodies submitted to him for examination several were those of patients who, having died rapidly and without time for the occurrence of

any complications, supplied the most favourable specimens for his investigations. Up to this date Dr. Koch had been unable to say positively whether the bacilli he had discovered were sufficiently characteristic to enable them to be regarded as distinct from other very similarly-shaped intestinal bacilli. By methods which he has adopted, he states he has now been enabled to isolate them, to propagate them artificially, to observe in them properties which will enable them certainly to be distinguished from other bacilli, and so far he believes he may speak positively as to their absence in the bodies of any persons who have died from diseases other than cholera. Should this discovery prove constant in further investigations, he maintains that the causal connexion between these bacteria and the cholera process will scarcely admit of doubt, even if all endeavours to induce the disease in other animals should fail. But even as regards the success of experiments on animals he is not without hope. The report next treats with the influence of sanitary measures on cholera in the city of Calcutta. Before 1870 the average annual mortality from cholera in Calcutta was at the rate of 10·1 per 1,000 inhabitants, whereas since 1870 it has diminished to 3 per 1,000, and it is stated that in the almost unanimous opinion of the local medical profession this result has been brought about by the introduction of a wholesome water-service. Referring to the alleged discovery, by the French Commission, of organisms peculiar to cholera in the blood, Dr. Koch points out that during many febrile disorders certain small, round, pale, protoplasmic bodies found in the blood of healthy persons become highly multiplied, and owing to their resemblance to micro-organisms they are then apt to be considered as bacteria. The same multiplication of these bodies, he says, goes on during the cholera process, a fact which has been mentioned by other investigators, and amongst them by Dr. Cunningham in his work on the *Microscopical and Physiological Researches into the Nature of the Agent Producing Cholera.* These are the bodies which he declares the French Commission must have erroneously interpreted, and he states that since they are found in the blood both of healthy persons and of persons suffering from other diseases, they cannot possibly have any causal connexion with cholera.

A further report was dated from Calcutta on February 2nd, 1884. It opens with the statement that the question left unsettled in the last report, viz., whether the bacilli found in cholera intestines are exclusively choleraic parasites, may now be regarded as solved; and this, notwithstanding the fact that great difficulties had to be overcome in assigning a significance to the cholera bacteria which had been found. The bacilli in question are described as "not quite rectilinear like the other bacilli, but slightly curved like a comma. The curvature is sometimes sufficient to give the bacillus a semicircular form. In the artificially-propagated specimens from these curved little rods are often produced little 'S'-shaped figures, and shorter or longer, slightly wavy lines, of which the first correspond to two individuals, and the second to a greater number of the cholera bacilli which have remained together in the process of continued multiplication. They are moreover possessed of independent movement, which appears to be very active, and may best be observed in a drop of nutrient solution suspended under a cover-glass. In this preparation the bacilli are seen to swim with great rapidity in every direction across the microscopic field of vision." Their behaviour is also described as characteristic in nutrient gelatine, indeed so much so that they can easily be recognised and isolated from other forms of bacteria.

For the purpose of controlling the results ascertained, twenty-eight corpses of subjects having died from such diseases as dysentery, simple diarrhœa, ulceration of the intestine, &c., as also their evacuations, together with samples of befouled water, were carefully examined, but nowhere, except in cases of cholera, could the comma-like bacillus be discovered. Dr. Koch next proceeds to consider whether the bacilli are merely promoted by the cholera process, or whether they are the cause of cholera, and he concludes that the latter view is the only one that can be entertained. Their appearance is limited to the intestine, except in cases in which it is clear from the fact that the vomit is alkaline, that matter from the intestine has made its way into the stomach; their first appearance coincides with the beginning of the malady; and they are only wanting entirely in those cholera cases in which, after recovery from that disease, death has been due to a succeeding malady. It would of course be

more satisfactory if, by the employment of these bacteria, a malady analogous to cholera could be induced in the lower animals. But Dr. Koch imagines that brutes are not susceptible to choleraic infection, and he certainly is supported in this view both by the result of previous experiment, and by the circumstance that whereas in Bengal choleraic infectional matter is spread broadcast throughout the whole year, no animals appear to suffer. But when he goes on to say that, notwithstanding the discovery of a specific bacterium in the case of enteric fever, it has also been found impossible to communicate that malady to animals, we cannot ıegard his argument as convincing, for it is more than doubtful whether any such causal bacterium has really been identified.

One observation repeatedly made by the Commission is that if the befouled linen of cholera patients were kept in a damp state for some twenty-four hours, the cholera bacilli increased in quite an extraordinary way; so also these bacilli were found to perish sooner after dessication than almost every other kind of bacteria. These facts may account for the frequency with which laundresses have suffered from cholera, and also for the rapidity with which the poison is at times destroyed in hot climates. It was further noted that the growth of the bacilli proceeds normally in nutrient substances with alkaline reaction, but that even so small an amount of free acid as has no perceptible influence upon the growth of other bacteria, strikingly retards their development. This is no recent discovery; it has before been regarded as accounting for the frequent escape from cholera of persons who have apparently received the infection into their stomachs, and it has by many been regarded as indicating the preventive treatment by acids. Dr. Koch finds further that in animals to which cholera bacilli have been administered by the stomach, no trace of them could be found after the animals had been killed, and he suggests it as possible that in man the bacilli only pass unharmed into the intestine in cases of disordered digestion. He then continues:—"Perhaps also a particular condition in which these bacteria are placed, and which may be analogous to the manent condition of other bacteria, may enable them to pass the stomach uninjured. It is of course not probable that this

change consists in the production of permanent spores, as such spores, according to experience, remain capable of life for many months, and even for years, while the cholera virus does not remain active longer than about from three to four weeks. Notwithstanding this it is quite conceivable that some other kind of durable condition exists, in which the bacilli may remain alive for several weeks in a dry state, and in which they are able to withstand the destructive action of the stomachic digestion. . . . Hitherto attempts to discover such a permanent condition of the cholera bacilli have failed."

A last report was despatched from Calcutta on March 4th. It records one of those many local outbreaks of cholera which have so often been regarded as due to a polluted water-supply. These local epidemics have often occurred around so-called "tanks," that is to say, in an aggregation of huts built around a marshy pond. These tanks are numerous all over Bengal; the ponds are used for such purposes as washing and bathing, as well as for drinking purposes, and by means of wretched latrines and otherwise they are often exposed to direct contamination with excreta. Hearing that an outbreak had occurred at Saheb Bagan, not far from Calcutta, the place was visited. The cholera attacks were found to be exclusively limited to several hundred inhabitants of huts around a tank, seventeen attacks terminated fatally, but no disease prevailed elsewhere in the same district. It was found that the tank, besides being used and befouled in the usual way, had been resorted to for the purposes of washing the soiled linen of the first fatal case. A number of samples were taken from the tank, cultivation in nutrient gelatine was carried out, and an abundance of cholera bacilli were discovered. Later on the same results could only be obtained when the samples of water were taken from a specially foul portion of the pond. This discovery, the first of its sort, must be regarded as one of very great importance. The remainder of the report is taken up with a record of further work done in these directions; first with a view of ascertaining the behaviour of the cholera bacilli in the presence of certain chemical substances, such as corrosive sublimate and carbolic acid; and second, of showing a permanent form of these bacilli. It is added that further investigations go to show that the bacilli can only be

ingested and incorporated into the human body in an active condition when they are in a moist state.

At this stage the German Commission left Calcutta, the heat having become so insupportable that work could no longer be carried out; their labours are however to be resumed. Other observers will doubtless take up the work, and the various conclusions at which Dr. Koch and his fellow-labourers have arrived will be very critically examined. Before they can be finally accepted they will need to be thus tested; but in the meantime we would express our admiration of the diligent research which has been pursued, and our deep regret that our own country did not take a prominent part in a scientific work in which it has such deep and imperial interests.

VACCINATION AND SPURIOUS VACCINATION.

UNDER the above heading a work has been issued by Dr. Joseph Jones, President of the Board of Health of the State of Louisiana, which is probably unique of its kind. The need for securing more complete vaccination of the population, and for removing ignorant and unfounded objections to the operation has in several parts of the United States become a matter of considerable public importance, and with a view of diffusing trustworthy information on the past history of small-pox, cow-pox, and vaccination, Dr. Jones has, as the result of some considerable labour both in his own country and in Europe, compiled a volume which reproduces all the more important works bearing on the subject which were issued in the early days after the discovery of vaccination by Dr. Jenner. Amongst the works thus reproduced are the following by Dr. Edward Jenner himself:—(1) "An Inquiry into the Causes and Effects of the Variolæ Vaccinæ Disease, discovered in some of the Western Counties of England, particularly Gloucestershire, and known by the name of Cow-pox." Third Edition, 1801; (2) "Further Observations on the Variolæ Vaccinæ, 1799;" (3) "A Continuation of Facts and Observations relative to the Variolæ Vaccinæ, or Cow-pox, 1801;" (4) "Account of the Origin of

the Vaccine Inoculation;" (5) "Instructions for Vaccine Inoculation;" and (6) A work pointing out how Drs. Woodville and Pearson—both of whose works are included in the volume—fell into certain errors in the performance of Cow-pox Inoculation. Then follow important works by Willan; the "Report of the Royal College of Physicians of London on Vaccination," 1807; various papers giving an account of the history of the subject and of small-pox up to and during 1818, and, as regards some points, on to a later date; the "Mortuary Statistics of London," which went to show that variolous inoculation had gone to increase the mortality from small-pox; and other mortality-tables showing the advantages to be obtained against small-pox by cow-pox inoculation. After this comes a lengthened series of papers giving the history of the introduction of vaccination into various countries, such as England, Ireland, Schleswig-Holstein, Germany, France, and the various states of America, and some special information as to the incidence of small-pox in the black and white races. And later on, in connexion with the discussion of various points affecting vaccination, quotations are given from all the more important works relating to the subject, such as those by Ceely, Simon, Seaton, Ballard, Hutchinson, &c. There is also an account of the various groups of alleged cases of vaccino-syphilis, such as the Rivalta, Bergame, Auray, and other series. In short, the work is, as a mere compilation, one of the most useful that has been produced, and it is rendered the more attractive because it at the same time reproduces the plates with which Jenner and others illustrated their original works.

Summing up the grounds of opposition to vaccination which the State Board of Health have found it necessary to cope with, Dr. Jones gives them as follows:—

1. Ignorance, superstition, and prejudice.

2. Stupid and malicious opposition to all measures emanating from the Board of Health for the protection of the health and lives of the people.

3. Disbelief in the protective powers of vaccination.

4. A popular superstition that vaccination during the prevalence of small-pox tended to develop the disease in the person vaccinated.

5. The belief held by many people and by some physicians that the vaccine virus has degenerated since its introduction by Edward Jenner in 1798.

6. The frequent failure of the bovine virus furnished by the various vaccine farms of the United States.

7. The dread of contracting various diseases of animal origin, through the medium of the bovine virus.

These objections may be regarded as applying not only to the State of Louisiana, but to a greater or less extent to certain classes of the population in this country, and with a view of dealing with them, primarily in his own country, Dr. Jones set himself to make careful investigation of those which it was possible to refute. This part of the subject occupies the later part of the volume, and it is too lengthy to be discussed here in detail. Some points, however, may be briefly referred to. As regards the communication of various diseases by means of humanised lymph, information is given which goes to show that this result when brought about is due to the neglect of the most ordinary precautions. Thus, as regards erysipelas, it is shown how this has been induced by the use of dried vaccine lymph, or scabs from persons who had themselves suffered from erysipelas during the progress of the vaccine disease; by coming into communication with erysipelas patients; or as the result of exposure to conditions calculated of themselves to induce erysipelas in any case where an abrasion of the surface of the skin existed, such as improper diet, bad ventilation, exposure to the exhalations of patients suffering from fever, gangrene, pyæmia, or offensive suppurating wounds. Then again, with regard to syphilis, it is held, as indeed it must be, that this disease may be communicated during the operation of vaccination; but Dr. Jones explains that by observing the ordinary precaution of using lymph from the arms of healthy children he never found any such result following on his vaccinations, and where evidence of syphilitic inoculation appears it is in connexion with the use of lymph from obviously syphilitic persons; so also the operators themselves were often entirely unskilled. Thus, common soldiers during the American War would vaccinate each other, and acting upon the belief that the larger the sore the more complete would be the protection, the very worst arms were chosen for lymph, and the

vaccinifers were at times suffering from the most patent of the active signs of syphilis. In this respect Dr. Jones's experience fully accords with that which has been obtained in this country, and to which we advert elsewhere in connexion with the issue of Dr. Buchanan's last official report. This same report may be referred to as to another matter noted by Dr. Jones, and that is, the frequent failure of the bovine virus as furnished by the various vaccine farms of the United States. The same sort of failure was anticipated by many when the use of animal lymph was first introduced into this country. But Dr. Buchanan is now able to report that indications are beginning to appear that there is much less difference than has heretofore been supposed between calf and humanised lymph, and that under the actual conditions of lymph selection and of operation as carried out at our metropolitan calf lymph station, and its affiliated station, "there has recently seemed little or nothing to choose between the one and the other kind of lymph either in respect of insertion success, or in respect of local and constitutional effect produced. And further, the influence of storing upon the activity of the lymph, at one time believed to be more rapid and more pronounced in the case of the calf-product, is now appearing to be not very different in the case of humanised lymph and calf lymph."[1] And turning to the appendix to the report for the material on which this statement is based we find the insertions success at the calf station to have been as follows. In the case of direct vaccination from the calf 96·3 per cent. of the insertion succeeded, and in direct arm-to-arm vaccination 95·0 per cent. succeeded. Where stored lymph was used the success in the case of animal lymph was 71·7 per cent., and in the case of humanised lymph 57·9 per cent.

Dr. Jones's work is one that merits a wide circulation. It appears as an extract from the Official Report of the Board of Health to the General Assembly of Louisiana, 1883-84, but it may possibly be procured through the State printer at New Orleans.

[1] Medical Officer's Supplement for 1882, to the *Twelfth Annual Report of the Local Government Board.*

THE PRACTITIONER.

AUGUST, 1884.

Original Communications.

MICRO-ORGANISMS AND DISEASE.

BY E. KLEIN, M.D., F.R.S.

Joint-Lecturer on General Anatomy and Physiology in the Medical School of St. Bartholomew's Hospital, London.

(*Continued from* p. 40.)

CHAPTER XI. *continued.*

THE bacilli in the tuberculous deposits of cattle are always contained in the cells; the larger the cell the more numerous the bacilli. This fact comes out very strikingly in thin and well-stained sections. Around many of the smaller and larger clumps of bacilli the cell-outline is still recognisable, and when the cell disintegrates, as it does sooner or later, the bacilli become free in groups; in this respect there exists a remarkable similarity between leprosy and bovine tuberculosis. But in the human tubercles the bacilli are always scattered between the cells.

I cannot agree with Koch, Watson Cheyne, and others, who maintain that each tubercle owes its origin to the immigration of the bacilli, for there is no difficulty in ascertaining that in human tuberculosis, in tuberculosis of cattle, and in artificially

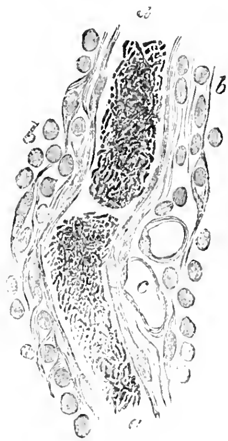


Fig. 72.—From a Section through the Kidney of Rabbit dead of Artificial Tuberculosis.

a. Blood-vessel filled with caseous matter, and in it numerous tubercle-bacilli.
b. Nuclei of cells of tubercular new growth.
c. Capillary vessel in cross section.

Magnifying power 700.

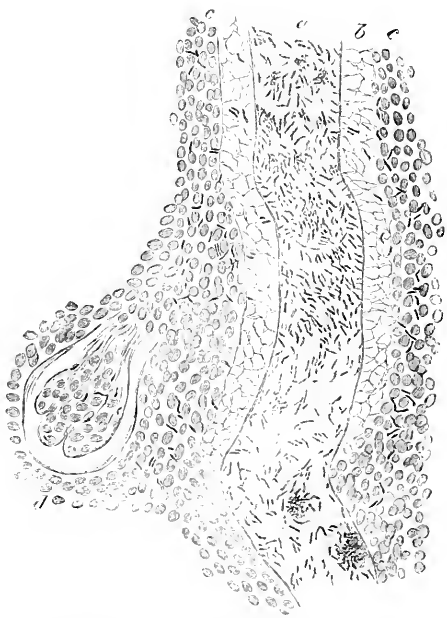


Fig. 73.—From the same Kidney as in preceding Figure.

a. Large artery filled with caseous matter, and in it numerous tubercle-bacilli.
b. Coat of artery.
c. Nuclei of the tubercular newgrowth.
d. A Malpighian corpuscle.

Magnifying power about 500.

induced tuberculosis of guinea-pigs and rabbits, there are met with tubercles in various stages—young and adult—in which no trace of a bacillus is to be found; whereas in the same section cheesy tubercles may be present containing numbers of tubercle-bacilli.

Schuchardt and Krause [1] have found tubercle-bacilli, though sparingly, in fungoid and scrofulous inflammations; Demme [2] and Doutrelepont [3] found the tubercle-bacilli also in the tissue of lupus. But the bacilli occurring in the lupus-tissue, as far as I am able to see, are morphologically different from the tubercle-bacilli. In a preparation made of the juice of lupus-tissue, large transparent cells with several nuclei are found,

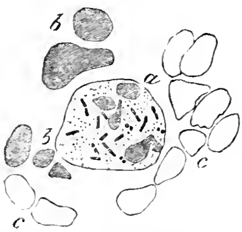


FIG. 74.—FROM THE JUICE OF LUPUS-TISSUE PREPARED AFTER THE KOCH-WEIGERT METHOD OF DRYING A THIN LAYER ON A COVER GLASS.
Magnifying power about 700.

in the cell-substance of which are noticed groups of thickish short bacilli, thicker and shorter than tubercle-bacilli. These bacilli are either placed singly or in chains of two.

The so-called Bacillus of Cholera.—In the reports from India by Dr. Koch, as the head of the German Commission sent to investigate the recent outbreak of cholera in Egypt, we notice that, like the French Commission, they failed to communicate the disease to animals; that the German Commission failed to discover any specific organism in the blood of patients suffering from cholera; that the intestines contained in their cavity and wall numerous peculiar "comma-shaped" bacilli, which Koch considers to have a special relation to the disease. Considering the state of the intestine in this disease, the presence of the bacilli, however peculiar, in its wall is in itself not convincing proof of their specific nature. Considering also that animals are as yet found insusceptible to cholera, artificial cultivations of these bacilli, successfully accomplished by Koch, cannot be tested.

From the artificial cultivations of these comma-shaped bacilli, Koch learned that it is necessary that the nourishing medium should have an alkaline reaction,

[1] *Fortschritte d. Med.* 9, 1883.
[2] *Berliner klin. Woch.* 15, 1883.
[3] *Monatshefte f. practische Dermatologie*, 6, 1883.

and that the bacilli are easily killed by drying. Koch found these comma-shaped bacilli in linen soiled with the cholera dejecta, also in the water of a tank that had produced cholera in several people who had partaken of it. As soon as the bacilli disappeared in this water cholera cases ceased.

My friend Mr. A. Lingard has placed at my disposal sections through the human intestine from cases of dysentery; there are seen in the superficial parts of the necrosed mucous membrane large numbers of putrefactive bacilli. In some cases, however, in the depth of the tissue there are found, amongst the extravasated blood-corpuscles, numbers of very fine, long, straight, or more commonly curved, bacilli and bacillus-filaments; some are distinctly made up of a chain of long bacilli. They stain well and conspicuously in methyl-blue.

CHAPTER XII.

VIBRIO.

VIBRIONES are characterised by being rod-shaped, but not straight; they are more or less wavy; and they are motile.

(*a*) *Vibrio rugula* consist of rods of about 0·008 to 0·016 mm. in length, and are curved either like a C or like an S. They are single, or form chains of two. Their protoplasm is

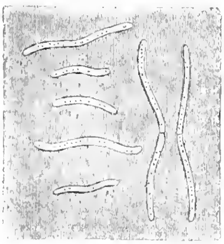


FIG. 75.—VIBRIO RUGULA (AFTER COHN).

FIG. 76.—VIBRIO SERPENS, ISOLATED (AFTER COHN).

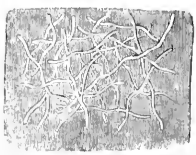


FIG. 77.—VIBRIO SERPENS IN SWARMS (AFTER COHN).

always slightly granular. They are found in putrefying organic substances, and often form continuous masses, the individuals interlacing in all directions.

(*b*) *Vibrio serpens*.—This is also a septic organism, much thinner and longer than the previous one, more wavy, as a rule,

curved into a single or double wave. The length varies between 0·011 and 0·025 mm. It is motile; and also forms continuous masses, the individuals interlacing in all directions.

CHAPTER XIII.

SPIROBACTERIUM (*Spirillum*).

SPIRILLA are filaments of a spiral shape, motile, and owing to their shape follow a spiral course when moving. They are probably capable of forming minute bright spores.

1. *Septic spirilla.*—These are found in all kinds of putrefying organic substances, and are of three kinds.

FIG. 78.—SPIRILLUM TENUE, (1) SINGLY AND (2) IN SWARMS (AFTER COHN).

(*a*) *Spirillum tenue.*—This is much finer and more wavy than vibrio serpens, the turns being closer together and spiral. Its length varies between 0·002 and 0·005 mm.; it often forms continuous felted masses; it is motile.

Occasionally the spirilla grow to a great length—two, three, and more of them forming a chain; the individual spirilla are not arranged in a linear series, but folded into a zigzag. This form, which in reality is not a special kind of spirillum, is called by Cohn[1] *spirochæta plicatilis.* The spirillum found in the tartar of the teeth is of this form, *spirochæta denticola.* But there exist all intermediate forms between a single spirillum tenue and a spirochæta. In stained specimens the construction of the spirochæta from several spirilla tenua is very distinct.

[1] *Beiträge zur Biologie d. Pflanzen*, vol. ii.

(*b*) *Spirillum undula* is much thicker and shorter than the former; there are all forms between such as are only half a turn to such as are of a whole turn of a spiral. It is motile and forms chains of two or more elements, occurring also in continuous masses, occasionally held together by a hyaline interstitial substance.

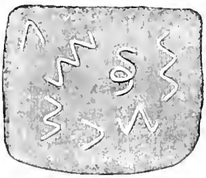


FIG. 79.—SPIRILLUM UNDULA (AFTER COHN).

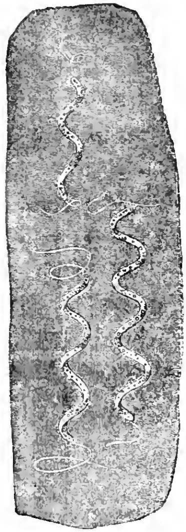


FIG. 80.—SPIRILLUM VOLUTANS (AFTER COHN).

(*c*) *Spirillum volutans.*—These organisms are giant spirilla; long and thick, with granular protoplasm; 0·025 to 0·03 mm. long; motile, and with a flagellum at each end.

2. *Pigment spirilla.*

(*a*) I have seen on paste a spirillum morphologically identical with spirillum undula; it is of a pale pink or rosy colour.[1] It is motile, and forms a kind of zoogl≈ìa, the individuals being closely placed and therefore producing a rosy colour of a more decided tint. Where they form continuous masses, the naked eye can detect the rosy tint.

(*b*) *Spirillum sanguineum* (*Ophidomonas sanguinea* Ehrenberg).—This was observed by Cohn and Warming[2] in pond

[1] "On a Rose-Coloured Spirillum," *Quar. Journ. of Micr. Sci.*, vol. xv. New Series.

[2] *Beitr. z. Biol. d. Pflanzen*, vol. i.

water. Morphologically it is identical with spirillum volutans. It is motile, with a flagellum either at one or both ends; Warming occasionally saw two and three flagella at one end. It is about 0·003 mm. thick; all forms occur between such as have half and such as have two and a-half turns of a spiral. Lankester also saw the same kind of organism amongst his peach-coloured bacteria.[1]

3. *Pathogenic spirilla.*

Spirillum Obermeyeri (of relapsing fever) is morphologically identical with spirillum tenue (or spirochæta plicatilis of Cohn). It was discovered in great numbers by Obermeyer,[2] in the blood of the general circulation in patients suffering from relapsing

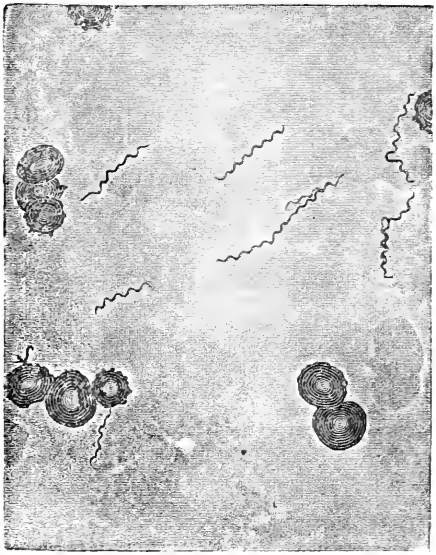


FIG. 81.—BLOOD OF RELAPSING FEVER (HUMAN).
Blood-corpuscles and spirilla Obermeyeri.
Magnifying power 700. (After Koch.)

fever. The spirilla disappear from the blood during the non-febrile stages, gradually decreasing in numbers. They are motile; they come out well in specimens of blood made after

[1] *Quarterly Journ. of Micr. Science*, vol. xiii. New Series.
[2] *Centralbl. f. med. Wiss.* 10, 1873.

the Weigert-Koch method of drying the blood in a very thin layer, and then staining with methyl-violet or Bismarck-brown.[1] Vandyke Carter[2] succeeded in producing relapsing fever in monkeys by inoculation with human blood containing the spirillum Obermeyeri. The blood in the monkey contained the

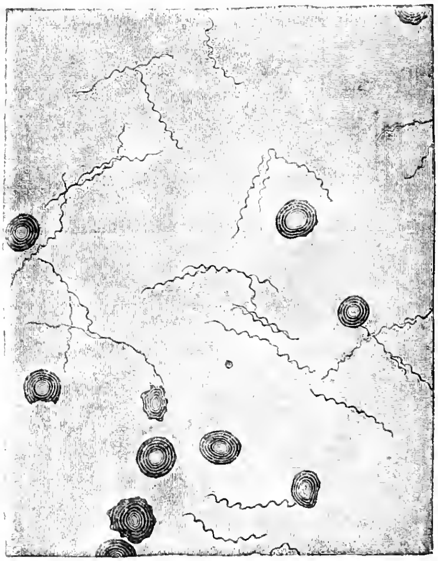


FIG. 82.—BLOOD OF APE INOCULATED WITH BLOOD SHOWN IN PRECEDING FIGURE.
Blood-corpuscles and spirilla.
Magnifying power 700. (After Koch.)

same spirilla in great numbers. Koch has cultivated artificially the spirilla Obermeyeri, and saw them growing into long spiral threads.[3]

1 Weigert, *Deutsche med. Woch.* 1876; Heydenreich, Berlin, 1877.
2 *Ibid.* 1879, and *Lancet*, 1, 1880.
3 *Deutsche med. Woch.* 19, 1879.

CHAPTER XIV.

YEAST FUNGI: TORULACEÆ, SACCHAROMYCES.

Yeast, *torula* (Pasteur), or *saccharomyces*, is not a bacterium, but belongs to an altogether different order of fungi — the *Blastomycetes*. It consists of spherical or oval cells, very much larger than the largest micrococci, and as in the case of these, each cell consists of a membrane and contents. The contents are either homogeneous or finely granular protoplasm; in the latter case there are generally present one, two, or more small vacuoles.

There are a great many species of *Torula*, varying from one another morphologically chiefly in their size, and physiologically by their action on various fluids (see below).

The cells multiply in suitable media by gemmation, a minute knob-like projection appearing at one side of the cell, and enlarging till it reaches nearly the size of the original or mother-cell. It finally becomes altogether constricted off from this latter, or having reached its full size remains fixed to the mother-cell, and each cell again producing by gemmation a new cell. In this way aggregations of four, six, eight, or more cells are formed, which may be arranged either as a chain when the production proceeds in a linear manner, or, if the gemmation takes place laterally as a group.

Under varying conditions of growth, *e.g.* on transplanting ordinary yeast growing in sugar-containing fluids on to potato, but sometimes also in the same nutritive fluid, it is observed that some of the yeast cells enlarge twice, thrice, and more times; they then form in their interior two, three, or more small cells by endogenous formation; these new cells are regarded as spores[1]—the mother-cell being an *ascospore*—and become free by finally bursting the membrane of the mother cell. On sowing these new cells into sugar-containing fluids they multiply by the process of gemmation.

[1] T. de Seynes, *Comptes Rendus*, 1866; Rees, *Bot. Zeitschr.* 1869; Hansen, *Carlsberg Laborat.* 1883.

Classifying them according to physiological function there are various species of torula or saccharomyces. They all have the power to split up sugar into alcohol and carbonic acid, but this power is not possessed by all to the same degree.

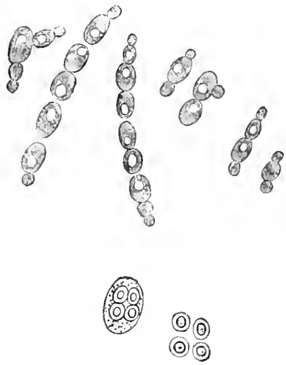


FIG. 83.—TORULA OR SACCHAROMYCES.
In the lower part of the figure an ascospore and four isolated spores (after Rees) are shown. Magnifying power about 700.

(*a*) *Saccharomyces cerevisiæ* (*Torula cerevisiæ*).—This is the ordinary yeast used in the production of beer. The individual full-grown cells vary in diameter from 0·008 to 0·01 mm.; they form beautiful long chains. They produce ascospores.

(*b*) *Saccharomyces vini* is very common in the air, and produces alcoholic fermentation of grape-juice; it is therefore the proper yeast of wine-production. Its cells are elliptical, slightly smaller than the former; it forms ascospores.

(*c*) *Saccharomyces pastorianus* is of various kinds (Hansen): in some the cells are about 0·002 to 0·005 mm. in diameter, in others larger. Some form ascospores, others do not. Most of them can be found in wine-fermentation and in cider-fermentation, but only after the first alcoholic fermentation is completed. They are very common in the air. I have sown a saccharomyces, which was contained in ordinary water, on solid nourishing media (gelatine, and gelatine and broth). It grew up copiously and formed groups of a distinct pink colour. When growing in the depth of the nourishing medium it grew as a colourless torula, no ascospores were formed, multiplication taking place by gemmation only.[1]

[1] *Quart. Journ. of Micr. Science*, 1883.

(*d*) *Saccharomyces mycoderma* (*Mycoderma vini*). This yeast is found forming the scum or pellicle on the surface of wine, beer, and fermented cabbage (*Sauerkraut*); its cells are oval, about 0·006 mm. long and 0·002 broad. It forms chains; the ascospores are two or three times larger. It has nothing to do with the alcoholic fermentation, and is not to be confounded with *mycoderma aceti*,[1] which is a bacterium and the efficient cause of acid fermentation in wine and beer.

The saccharomyces mycoderma does not grow well in the depth of liquids, but when sown into a liquid of acid reaction

FIG. 84.—SACCHAROMYCES MYCODERMA, OR OIDIUM ALBICANS.
From an artificial cultivation in dilute nourishing material.
d. Branched mycelium.
fα. Torula stage.
fβ. Mycelial stage.
(After Grawitz.)

and containing but little sugar, Cienkowsky saw the cells elongating into cylindrical elements; each of which by gemmation produced a new cell which also elongated, and so on till a linear series of cylindrical cells was formed, separated from one another only by a thin septum; a mass of filaments very much resembling a mycelium was thus formed. The cylindrical cells give origin by gemmation to spherical and elliptical torula-cells.

Such a growth, in which the torula-cells are capable of forming a sort of mycelium, was formerly called *oïdium*, and as *oïdium albicans* is recognised as the cause of "thrush;" the well-known

[1] Nägeli, see chapter viii. 2.

white patches which form on the mucous membrane of the mouth and pharynx in suckling infants and debilitated patients.

Grawitz[1] has proved by observations on artificial cultures that this fungus is identical with the oïdium variety of *Saccharomyces myeoderma;* the cells are spherical or cylindrical, the former about 0·003 to 0·005 mm. in diameter, the latter up to 0·03 or 0·05 mm. long. As above described it forms mycelium-like filaments from which, by lateral and terminal gemmation, spring spherical or oval torula-cells. It also forms ascospores containing four to eight spores.

CHAPTER XV.

MOULD-FUNGI: HYPHOMYCETES, OR MYCELIAL FUNGI.

Of this class of fungi only those are of special interest to the pathologist which in some way or other are connected with disease. The fungi consist of branched and septate threads or hyphæ; each filament or hypha is composed of a row of cylindrical cells, consisting of a membrane and clear protoplasm, the individual cells being separated from one another by a thin transverse septum; they increase in number by fission, and in this way the filaments increase in length. The growing ends of the hyphæ are filled, not with transparent, but with highly-refractive protoplasm. Some cells, by budding out laterally, produce cylindrical threads, which subdivide into a series of cylindrical cells, these by division and lengthening forming a new branch-hypha. The filaments form by their branches an interlacing feltwork, called thallus or mycelium. The mycelial fungi which interest us, belong to the order known to botanists as the *Ascomycetes.* They are characterised by the fact that one or other branch of the mycelial-hyphæ produces at its end a series of spherical or oval cells—the conidia-spores or *conidia.* In addition to this some of the hyphæ form peculiar large mother-cells, or *sporangia,* in the interior of

[1] *Virchow's Archiv,* vol. lxx.

which spores are formed by endogenous formation. When these sporangia are cylindrical or club-shaped, they include eight spores, and are called *asci*; the spores being *ascospores*. All conidia or spores by germination grow into the mycelial threads which become septate or subdivided into a row of cylindrical cells; these by division cause the lengthening of the mycelial threads.

(*a*) *Oïdium lactis.*—Here the mycelium is composed of septate branched filaments of various thicknesses. Some branches of the mycelium at their ends or laterally at a septum produce by division a series of spherical or oval conidia-spores, about 0·007 to 0·01 mm. long. These ultimately become isolated, and

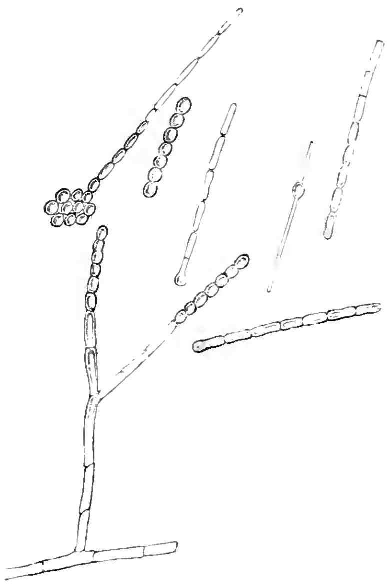


FIG. 85.—OIDIUM LACTIS.
Mycelium and spores.

then germinate into a short cylindrical filament, which subdivides by transverse septa into a series of cylindrical cells; these by continued growth and division give origin to the ordinary septate branch-hyphæ. The formation of conidia proceeds at the ends of these in the same manner as before. The oïdium lactis forms a whitish mould on milk, bread, paste, potato, &c.

Favus, Herpes tonsurans, and Pityriasis versicolor of man and animals, are, according to the researches of Grawitz,[1] due to a fungus in morphological respects identical with oïdium lactis. In favus it is known as *Achorion Schoenleini*, in Herpes tonsurans as *Trichophyton tonsurans*, in Pityriasis versicolor as *Microsporon furfur*. Grawitz has shown by artificial cultures

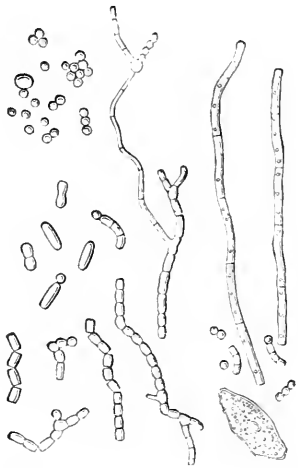


FIG. 86.—FUNGI FROM A FAVUS-PATCH (NEUMANN).

on gelatine, that the spherical or oval conidia germinate into shorter or longer cylindrical filaments, which by subdivision form septate mycelial hyphæ. These and their branches give origin in their turn to spherical or oval spores or conidia. They, as well as the hyphæ, differ in size in the various species.

Malcolm Morris and G. C. Henderson,[2] on the other hand, maintain, that by artificial cultivation of the spores of Trichophyton in the substance of gelatine-peptone, at temperatures varying from 15° to 25° C., these grow into branched-septate mycelial filaments, which by their mode of fructification are seen to be identical with the mycelium of *Penicillium*. Compare also Babes.[3]

(*b*) *Aspergillus*. Some of the branches of the mycelium of

[1] *Virchow's Archiv*, vol. lxx. p. 560.
[2] *Journal of the Royal Microscopical Society*, April 11, 1883.
[3] *Archives de Physiologie*, 8, 1883, p. 466.

this fungus assume an upright position, are thicker and not at all, or only slightly, septate, and at their end form flask-shaped

FIG. 87.—ASPERGILLUS GLAUCUS (AFTER DE BARY.)
A. Hypha, the end of which c bears
st. The basidia.
as. Ascogonium.

enlargements, from which grow out radially short cylindrical cells—*basidia;* and these again at their distal or free ends

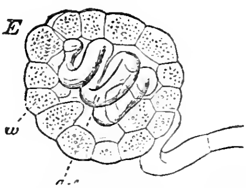


FIG. 88.—E. PERITHECIUM, HIGHLY MAGNIFIED.
as. Ascogonium.
w. Cells of the pollinodia.

produce chains of spherical spores or conidia. This is a very common mould, and according to differences in the coloration

of the mycelium and spores is subdivided into different species: *A. glaucus, candidus, flavescens, fumigatus, &c.*

Besides this mode of spore-formation (asexual), there is another (sexual) which according to De Bary consists in this: some terminal branch of the mycelium becomes twisted like a spiral, this is considered the female organ of fructification or *carpogonium*; from the same thread branches grow towards the carpogonium; one of these branches becomes fused with the terminal portion of the carpogonium called the ascogonium, while the others—the *pollinodia*—branch and surround the carpogonium like a capsule, the whole organ is now called a *perithecium.* Finally the ascogonium by rapid division gives origin to a number of oval septate tubes, inside of which by endogenous formation numerous spores make their appearance.

Grohe [1] was the first to show that the introduction of the spores of some species of aspergillus into the vascular system of rabbits sometimes produces death, with symptoms of metastasis into the various organs due to localised foci, where these spores grow into mycelial filaments. Lichtheim [2] showed that such mycoses in rabbits cannot be produced by the spores of *Aspergillus glaucus,* but by those of *Aspergillus flavescens* and *fumigatus.* Grawitz [3] studied this process more minutely, and found that no matter whether the spores are injected into the vascular system or into the peritoneal cavity, there are established in the kidneys, liver, intestines, lungs, muscles, and occasionally in the spleen, marrowbones, lymphatic glands, nervous system, and skin, minute metastatic foci, due to the growth of the spores into mycelial filaments with imperfect organs of fructification, but no spore-formation. Grawitz thought that the spores of ordinary moulds (penicillium and aspergillus) are capable of assuming these pathogenic properties if cultivated at higher temperatures (39°—40° C.), and in alkaline media. These fungi, as is well known, grow well at ordinary temperatures and in acid media, and are then innocuous when introduced into the animal body; but by gradual acclimatisation they can also be made to grow at

[1] *Berl. klin. Woch.* 1871.

[2] *Ibid.* 9 and 10, 1882.

[3] *Virchow's Archiv,* vol. lxxxi. p. 355.

higher temperatures and in alkaline media, when they assume pathogenic properties, becoming capable of resisting the action of living tissues and of growing in them. This view has been proved to be incorrect by Gaffky,[1] Koch,[2] and Leber.[3]

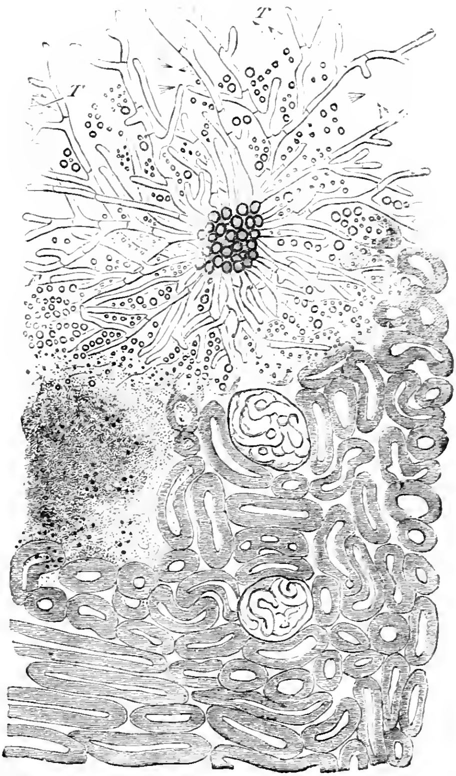


FIG. 89.—FROM A SECTION THROUGH THE KIDNEY OF A RABBIT, DEAD 36 HOURS AFTER THE INJECTION OF SPORES INTO THE JUGULAR VEIN.

F. Fat droplets. *T.* Tyrosin crystals.

In the upper part of the figure is a metastatic focus composed of Aspergillus spores and mycelium. In the lower half of the figure the urinary tubules and two Malpighian corpuscles are seen. (After Grawitz.)

Those spores that do exert such pathogenic properties are not at all dependent on such acclimatisation, and are not ordinary moulds, but a distinct species of aspergillus (Lichtheim), which grows well at higher temperatures (38°—48° C.), and the spores

[1] *Mittheil. a. d. kais. Gesundheitsamte*, 1880.
[2] *Berl. klin. Woch.* 1881. [3] *Ibid.* 1882.

of which under all conditions of growth are capable of producing in rabbits the mycosis in question.

(*c*) *Penicillium.*—In this fungus hyphæ which are not septate grow out from the mycelium; from the end of each of these arise like the fingers of the hand a number of short branched cylindrical cells, which give origin to chains of spherical spores.

The following two fungi belong to the order of fungi called *Phycomycetes.*

(*d*) *Mucor* is characterised by this, that from the mycelium hyphæ grow out which are not septate, and at the end of these a large spherical cell originates, the *sporangium,* in which by endogenous formation a large number of spherical spores are developed; the wall of the sporangium giving way, the spores become free.

(*e*) *Saprolegnia;* colourless tubular threads, forming gelatinous masses on living and dead animal and vegetable matter in fresh water. The cylindrical or flask-shaped ends of the threads—*zoosporangia*—form in their interior numbers of spherical or oval spores, *zoospores,* which are possessed of locomotion (one flagellum at each pole) and finally escape from the threads. These zoospores after some time become resting spores, surround themselves with a membrane and finally germinate into a cylindrical mass which becomes transformed into the mycelium. Besides this asexual mode there is a second or sexual mode of fructification consisting in this: At the end of a mycelial thread a cell grows up into a spherical large ball, the *oogonium.* From the same thread thin threads—*antheridia*—grow towards the oogonium, with the protoplasm of which they merge. This latter then differentiates into a number of spherical masses, the *oospores,* which become invested with a membrane. These become free and then germinate and grow into a mycelium. Saprolegnia grows on the skin of living fish, and there causes severe illness often terminating in death. Thus the salmon disease, as Professor Huxley has shown,[1] is caused by this parasite. The zoospores of this salmon saprolegnia are however, as Huxley has shown, as a rule non-motile. The hyphæ of the fungus traverse the epidermis in the diseased patches of the salmon, and they bore through the superficial layer of the derma, a stem-part being

[1] *Proceedings of the Royal Society,* No. 219, 1882.

situated in the epidermis, and a root-part in the derma; each of these elongates and branches out. "The free ends of the stem-hyphæ rise above the surface of the epidermis and become converted into zoosporangia, more or fewer of the spores of

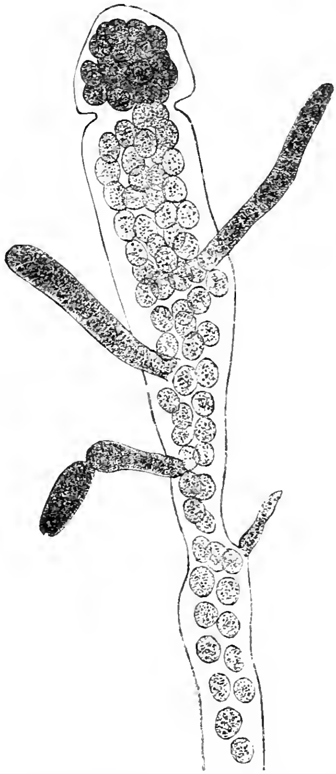


FIG. 90.—SAPROLEGNIA OF SALMON DISEASE.
A sporangium filled with zoospores; in connexion with them several young mycelial threads.

which attach themselves to the surrounding epidermis and repeat the process of penetration." In saprolegnia associated with the salmon-disease Professor Huxley observed only the asexual mode of fructification.

CHAPTER XVI.

ACTINOMYCES.

In cattle there occurs a fatal disease, which is characterised by the formation of firm nodules of various sizes, due to a growth of small cells. In the centre of the nodules lie dense groups of peculiar club-shaped corpuscles—actinomyces-corpuscles—radiating from a firm homogeneous centre, and joined to this by longer or shorter, single or branched, filamentous stalks. Each of these actinomyces-corpuscles appears homogeneous, and of a bright

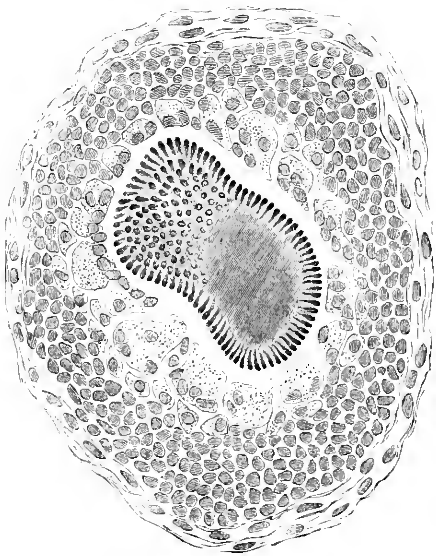


Fig. 91.—From a Section through the Tongue of a Cow dead of Actinomycosis. A nodule is shown composed of round cells, in the centre is the clump of actinomyces surrounded by large transparent cells. Magnifying power 350.

slightly greenish lustre. These masses consist of what is called *Actinomyces* (Bollinger), and the disease is termed actinomycosis. In cattle the disease manifests itself by firm tumours in the jaw, in the alveoli of the teeth, and particularly by a great enlargement and induration of the tongue—"*wooden tongue.*" On

making sections through this latter organ there are found present in all parts microscopic tumours of small-cell growth. In the centre of each tumour is a clump of actinomyces. This clump is surrounded by a zone of largish cells, with one to four nuclei. The periphery of the tumour is made up of a fibrous capsule,

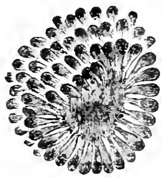


FIG. 92.—A CLUMP OF ACTINOMYCES, MORE HIGHLY MAGNIFIED: × 700.

with spindle-shaped cells. Occasionally the tumours are to be seen also in the skin and in the lung; in the latter organ they appear as whitish nodules, easily mistaken for tubercles.[1] Bollinger first described the disease in cattle.[2] Israel[3] was the first to point out a disease in man, characterised by metastatic abscesses (spreading it seems from a primary abscess of the jaw) in various internal organs, due to the presence of a fungus, which afterwards was identified as actinomyces, and Ponfick[4] has clearly established that in man it is not a rare disease.

According to careful observations, Johne[5] succeeded in transmitting the disease from cattle to cattle by inoculation, but not by feeding. He also found,[6] in twenty out of twenty-one healthy pigs examined, the actinomyces present in the crypts of the tonsils.

Israel[7] succeeded in transmitting the disease to a rabbit by inserting into the peritoneal cavity a piece of a human antinomyces-tumour.

R. Virchow quite recently,[8] in conjunction with O. Israel and

[1] Pflug, *Centralbl. f. med. Wiss.* 14, 1882; Hink, *ibid.* 46, 1882.
[2] *Ibid.* 27, 1877.
[3] *Virchow's Archiv*, vols. lxxiv. and lxxviii.
[4] *Die Actinomykose des Menschen*, Berlin, 1881.
[5] *Deutsche Zeitschr. f. Thiermedicin*, vii. 1881.
[6] *Centralbl. f. med. Wiss.* 15, 1881.
[7] *Ibid.* xxvii. 1883.
[8] *Virchow's Archiv*, vol. xcv. p. 544.

Duncker, ascertained that pork occasionally contained whitish chalky nodules, larger than those due to trichinæ, and containing in their interior the actinomyces.

O. Israel[1] claims to have succeeded in artificially cultivating the actinomyces on solid ox-serum; in fluid media the growth does not succeed, owing to the swelling up and death of the actinomyces-corpuscles.

CHAPTER XVII.

ON THE RELATIONS OF SEPTIC TO PATHOGENIC ORGANISMS.[2]

THERE is hardly any question which to the pathologist and sanitary officer can be of greater importance than the relation of septic to pathogenic organisms. To the pathologist the life history of a micro-organism, outside and within the animal body, must ever remain an important field of inquiry; to the sanitary officer all conditions affecting the life and death of those organisms which produce, or at least are intimately bound up with, infectious diseases, such as the distribution and growth of these micro-organisms outside the animal body, the agencies which affect it in a favourable and unfavourable sense, are the points which he has particularly to consider in dealing with the spread and prevention of infectious maladies. Now, it is known of many micro-organisms, both those that are associated with putrefactive processes as well as those that are bound up with infectious disease, that temperature, the medium in which they grow, presence and absence of certain chemical compounds are capable of materially affecting them. I need not for this purpose enumerate all that is known already by direct experiment, but will only limit myself to reference to the researches of Schröter, Cohn, and Wernich on that group of micro-organisms, known as pigment bacteria, *i.e.* bacteria which only under certain conditions, notably temperature and soil, produce definite

[1] *Virchow's Archiv*, vol. xcv. p. 142.

[2] The greater part of this chapter is copied from an Interim Report by myself to the Medical Officer of the Local Government Board, 1884.

pigments (Cohn's *Beiträge zur Biologie d. Pflanzen*); to those of Hansen (Carlsberg Laboratory) on yeast; to those of Neelsen on the bacilli producing the blue colour of milk, the bacillus syncyanus (*Beitr. zur Biol. d. Pflanzen*, iii. 2, p. 187); to the works of Toussaint, Pasteur, Chauveau, Koch, and others on the bacillus anthracis; Arloing, Thomas, and Cornevin on the bacillus of symptomatic charbon; of Koch on the bacillus of tuberculosis; of Israel on actinomyces, and many others; and particularly would I refer to the many valuable suggestions and considerations given by v. Nägeli on these points in his book, *Die niederen Pilze*, München, 1877 and 1882.

While from these observations it would appear that both septic and pathogenic micro-organisms are capable of suffering some modifications in their morphological and physiological behaviour, it is nevertheless still an open question whether an organism which under ordinary conditions is only associated with putrefactive changes in dead organic material, and which cannot under these ordinary conditions grow and multiply within the living body, can, under certain extraordinary conditions, become endowed with the power of growing and multiplying within the body of a living animal, creating there a pathological condition, inducing there an infectious disease.

Three distinct septic micro-organisms have, after numerous experiments and careful observations, been mentioned, as being capable when growing under certain extraordinary conditions of assuming pathogenic properties. These three organisms are: (*A*) the common bacillus of hay-infusion said by Buchner to be capable of transformation into bacillus anthracis; (*B*) a bacillus subtilis, present in the air, which, although quite harmless in itself, assumes distinct pathogenic properties when growing in an infusion of the seeds of *Abrus precatorius*, becoming thereby endowed with the power of causing severe ophthalmia (Sattler); (*C*) a common mould, aspergillus, which, harmless in itself, when grown on neutral and alkaline material at about the body-temperature (38° C.) assumes, according to Grawitz, very poisonous properties, producing in rabbits inoculated with it death, with metastasis of the aspergillus and its spores in the various internal organs.

There are in the literature of micro-organisms other cases

mentioned, in which such a transformation has been *supposed*, but without any experimental proof, and we need not therefore trouble ourselves more about them.

Let us now review *seriatim* the above three cases:

(*A*) Dr. Hans Buchner in a paper, which for many reasons may be considered an important one, " Ueber d. experim. Erzeugung des Milzbrandcontagiums, &c.," published in the *Sitzungsberichte d. math. physik. Classe d. k. Bairischen, Akademie d. Wiss.* 1880 heft iii., p. 369, states that he succeeded in transforming the common bacillus of hay-infusion, the hay-bacillus, into the bacillus anthracis.

The hay-bacillus and the bacillus anthracis rank together morphologically under that form which Cohn has named bacillus subtilis.

The two are, however, not quite identical in morphological respects. The hay-bacillus is a minute rod or cylindrical-shaped bacillus, which by elongation and division produces chains and ultimately threads just like the bacillus anthracis, but in the latter (*i.e.* bacillus anthracis) the bacilli and their threads are composed of cubical elements, as is shown in stained specimens and as has been mentioned in a former chapter, whereas in those of the hay-bacillus the elements are rods or cylinders. I have seen, however, many of the short hay-bacilli which being constricted, *i.e.* in the act of division, appear as two short more or less cubical elements placed end to end. It is generally assumed that in hay-bacillus the bacilli are always rounded at their ends, whereas the bacilli anthracis are as if straight cut at their ends; but this is not universally the case, since I have seen in cultures the bacilli anthracis with distinctly rounded ends. But, speaking generally, the hay-bacillus is a rod more distinctly rounded at its ends, the bacillus anthracis of the blood is not so.

The bacillus anthracis is slightly thicker than the hay-bacillus. In artificial cultivations carried on in neutral broth the bacillus anthracis is about twice as thick as the hay-bacillus growing in the same fluid, and when both are growing in neutralised hay-infusion the two are very conspicuously different from one another, and can at a glance be distinguished from one another the hay-bacillus being about half the thickness of the bacillus anthracis. In stained specimens, too, the latter is made up of

a beautiful row of cubical cells, whereas the former consists of cylinders only.

True, the bacillus anthracis is not always of the same thickness, for, as I have shown, when growing in neutral pork broth it is decidedly thicker than in the blood of an animal dead of anthrax. And also in the blood of different animals the bacillus anthracis slightly varies in thickness, for in the guinea-pig's blood it is slightly thicker than in that of the rabbit or sheep.

The hay-bacillus is motile, possessed of a flagellum and therefore capable of locomotion; the bacillus anthracis is not motile. I am quite aware that Cossar Ewart (*Quarterly Journal of Microscopical Science*, April 1878) states that he has seen in a specimen kept artificially heated under microscopic observation, that the bacillus anthracis, at first non-motile, is capable of becoming motile. At one or both ends a flagellum grows out from its body. But this observation is unreliable, since Ewart did not guard himself in any way from the accidental introduction of septic bacilli, many of which are motile. Besides, he says of the bacilli, which he figures as anthrax bacilli, that they are connected with one another by two fine threads, and that they probably separate from one another and each retains one filament, which is its flagellum. But his observations, so far as they have application to anthrax bacilli, are capable of quite a different interpretation. In every specimen of blood and in every artificial culture bacilli can be seen, in which at one place or more the protoplasm is wanting, owing, as I have shown, to degeneration; in such places only the empty sheath is present, and of course in fresh specimens this gives the appearance as if the two protoplasmic portions of the bacillus were connected with one another by two fine threads, *i.e.* the sheath being transparent is seen here edgeways or in "optical section."

In no instance has the bacillus anthracis been observed to be motile. I have examined thousands of specimens of fresh bacillus anthracis in the blood and in artificial cultures, and I have never seen anything that in the least would lead me to dissent from this proposition.

As regards the spores they are of the same aspect and size in

both the hay-bacillus and bacillus anthracis. The threads in good cultures form in both cases the same bundles more or less twisted and involved in convolutions, but in certain cultures of the bacillus anthracis, *e.g.* in broth, in which the growth is limited to the bottom of the fluid, the convolutions and the twisted condition of the threads are more pronounced, more cable-like.

Hay-bacillus being motile, every culture of it is uniformly turbid, the bacilli being capable of moving about, and after a day or two of incubation at 35° C. they form a distinct pellicle on the surface of the fluid, which in further stages becomes continuous and thick. These pellicles are composed of a dense feltwork of threads of the bacilli, and in them spore formation is going on.

By shaking the fluid the pellicle sinks to the bottom, and if the fluid is not yet exhausted, a new pellicle is formed of the same nature.

In no culture of hay-bacillus are there ever observed those cloudy, fluffy, whitish and transparent convolutions that are seen in cultivations of bacillus anthracis carried on at the bottom of fluid broth, and which have been so accurately described by Pasteur.

Both the hay-bacillus and the anthrax bacillus when growing on gelatine mixtures liquefy the gelatine; both when growing in meat broth turn the at first colourless fluid in the course of incubation to an amber, and later to a brown, tint.

The hay-bacillus is capable of thriving well in acid solutions, it grows copiously in hay-infusion, which is of a distinct acid reaction; the bacillus anthracis, although capable of making a slight progress in acid hay-infusion, does not get far, for degeneration soon sets in; it thrives best in neutral solutions. Hay-bacillus thrives also very well in neutral solutions.

Buchner states, that by successive cultivation of bacillus anthracis under *constant variation of the nutritive material* he saw it assume gradually the properties of hay-bacillus. Thus, he saw that its mode of growth gradually changed, inasmuch as instead of forming, as the typical bacillus anthracis does, fluffy convolutions at the bottom of the fluid nourishing medium, it gradually showed a tendency to stick to the glass and to the surface of the fluid, and to form a sort of pellicle

just as the hay-bacillus does. This I consider to be an erroneous interpretation of an easily explained and simple fact. It does not want any of the many successive generations of bacillus anthracis, by means of which Buchner says he has achieved this transformation; it simply requires two nourishing fluids, in both of which the bacillus anthracis will thrive well, but which fluids differ in specific gravity. Let Buchner do as I have done: let him take two test tubes, both containing sterile broth, but in one the broth concentrated, in the other dilute. Let him inoculate the two test tubes with bacillus taken from the same blood, say of a guinea-pig dead of anthrax; let him place them in the incubator at a temperature of 35°—42° C. After two or three days, and more decidedly later, he will notice this very difference in the aspect of the cultures that he lays so much stress on as indicating a change in the physiological character of the bacillus. One test tube, containing the dilute broth, shows the typical fluffy convolutions at the bottom of the fluid; while the other, containing concentrated broth, shows a distinct attempt at the formation of a pellicle. Let him now take out a droplet from this second test tube and inoculate with it two test tubes of the same nature as before, *i.e.* one containing concentrated broth, the other dilute broth. After two or three or more days of incubation he will find exactly the same differences as above.

Buchner states that the bacillus anthracis when carried through a large number of successive cultures, at a temperature of 35°—37° C., gradually loses its pathogenic properties. Of this assertion I have said already a great deal in my Report for 1881—1882, and I mention it here merely in connexion with Buchner's other assertions. I have shown, that even assuming that Buchner has had in all his cultures the true bacillus anthracis, a fact of which there is no definite proof, as Koch has so ably pointed out in his critical review of Buchner's work (*Mittheilungen aus dem k. Gesundheitsamte*, Berlin, 1881, Band I.), Buchner, having tested his cultures on white mice only, has fallen into a serious error; for, as I have shown (Reports for 1881—1882), a culture of bacillus anthracis may have become quite harmless to white mice, but be still very virulent to other animals. In fact, therefore, Buchner's

result does not require for its achievement more than one culture, provided this has been kept for several days or weeks without spore formation, as was the case in Buchner's experiments.

As regards Buchner's statement that by successive cultivation of bacillus anthracis at 35°—37° C., this assumes the morphological and physiological characters of hay-bacillus, I agree with Koch in regarding this as a complete error. If the cultures are quite safe from contamination nothing of the sort ever happens. I have now for several years carried on such cultures, and have not seen anything of the sort. It is of course clear that if by any accidental contamination, say at the time of inoculating a fresh tube, a motile septic non-pathogenic bacillus, in which or in the spores of which the air sometimes abounds, is introduced, every new culture established from this one will abound in this bacillus, and as it grows more quickly and more easily than the bacillus anthracis, the next cultivations become barren of all the bacillus anthracis, and only the non-pathogenic motile bacillus will be found present. This criticism has been applied by Koch to Buchner's experiments, and I most fully endorse it.

But there is a much more serious statement of Buchner's —serious, because if true in nature, it is dreadful to contemplate to what amount of anthrax man and brute may become subject—where he claims to have succeeded in transforming the hay-bacillus into bacillus anthracis, by carrying the former through many generations under ever varying change of soil. It is needless to detail here all these experiments of Buchner since I do not attach any great value to them, and I should not have troubled myself much about them were it not that one meets in mycological literature, particularly on the part of botanists, an acceptance of Buchner's statement that hay-bacillus can change into the pathogenic bacillus anthracis (see Zopf, *Die Spaltpilze*, Breslau, 1883).

I have repeated Buchner's experiments on rabbits, guinea-pigs, and white mice. I have grown the hay-bacillus in various kinds of broth, in gelatine broth mixtures, in hydrocele fluid, in peptone fluid, in Agar-Agar and peptone, at temperatures varying between 30° and 38° C., and I have, to put it shortly, never seen that it shows the least tendency to change its

morphological characters, or that it ever assumes any morphological or physiological character like the bacillus anthracis. I consider this a perfectly hopeless task, and I feel sure any one might as soon attempt to transform the bulb of the common onion into the bulb of the poisonous colchicum.

But Buchner states that with his cultures of hay-bacillus, carried through many generations under varying conditions of soil, he inoculated white mice, which died under symptoms of anthrax, and whose blood contained the typical bacillus anthracis. I do not for a moment doubt that he really had mice dying from anthrax after inoculation with cultures of hay-bacillus, but I question the admissibility of his interpretation. I believe that some accidental contamination of the culture of hay-bacillus with anthrax spores or otherwise may have occurred and have got overlooked. How liable one kind of infective material is to be invaded by foreign infective matter may be understood from the following examples of its actual occurrence.

It is now admitted on all hands that the results of Villemin in producing what is called artificial tuberculosis in guinea-pigs, by inoculating the animals subcutaneously with cheesy matter derived from human and bovine tuberculosis, or from a guinea-pig suffering from artificial tuberculosis, cannot be produced by any other means; it cannot be produced by ordinary, *i.e.* non-tuberculous cheesy or other pus,[1] nor by setons (as once thought by Wilson Fox and Sanderson) setting up chronic caseous inflammations in the skin of guinea-pigs, nor by chronic mechanical irritation, *e.g.* insertion into the peritoneal cavity of bits of gutta-percha or other substances producing chronic peritonitis (as was thought by Cohnheim and Fraenkel); but, as Cohnheim now tersely puts it, tuberculosis can be produced only by matter derived from a tuberculous source, and anything that produces this tuberculosis is derived from a tuberculous source. Dr. Wilson Fox, after the very important experiments performed by Dr. Dawson Williams, according to which chronic inflammation in the skin of guinea-pigs produced by setons is in no case followed by tuberculosis, has conceded that in his earlier experiments there must have entered some error in the use of the materials. Cohnheim has conceded the

[1] Compare Watson Cheyne, *Practitioner*, April 1883.

same. It is clear that these observers, while working at the same period with both tuberculous and non-tuberculous matter, must have had, in the course of experiments with the latter substance, accidental contamination with the former, and hence had the guinea-pigs inoculated by them with non-tuberculous matter nevertheless affected with tuberculosis. Dr. Williams, who had no contamination to fear, working with non-tuberculous matter only, had consequently no accidental contamination. This shows us how dangerous, as regards reliability of results, it is to work in one laboratory with different infective materials at the same period.

I have myself experienced some very curious results bearing on this very point. During the last year I have seen the following cases of accidental contamination occur. I work in the laboratory of the Brown Institution, which comprises a suite of rooms. Although working extensively on anthrax, I generally limit myself to one room only. A friend of mine, who one day injected into a vein of a guinea-pig blood taken from a blood-vessel of a dog suffering from distemper, found, to his great disappointment, the guinea-pig dead after two days with the typical symptoms of anthrax, the blood of this animal teeming with the characteristic bacilli. The hypodermic syringe used in this experiment for injection had not been previously used by me in my anthrax experiments, since I never use a syringe in my inoculations, but only glass pipettes freshly made and drawn out into a fine tube. The experiment was performed in the room adjoining the one in which my anthrax investigations were being carried on, but I was in the habit of making every day a good many specimens of anthrax cultivations and spores, so that there must have been a good many of these spores distributed on the table and floor, and these probably found their way into the wound of the guinea-pig at the time the above experiment was made.

Another gentleman working in the laboratory of the Brown Institution intended to inoculate several guinea-pigs with human tubercles. For this end he mashed up in saline solution, in a clean mortar, a bit of human lung studded with tubercles. He did this in my room on the same table on which I was working with anthrax. One of these guinea-pigs, inoculated

with human tubercle, died before the second day was over of typical anthrax. Its blood was teeming with the bacillus anthracis. Such an accidental anthrax in guinea-pigs inoculated with tubercle occurred several times. In all cases freshly drawn-out glass capillary pipettes had been used for performing the inoculation, and the other instruments also had been carefully cleaned before the inoculation.

I myself had the following accidental contaminations:—

A guinea-pig had been inoculated with a culture of bacillus anthracis, which I did not expect would produce anthrax, the culture not being capable of starting new cultures, the bacillar threads being all in a state of degeneration. The animal, of course, remained unaffected. Some weeks afterwards inspecting the guinea-pig, to my surprise, I found the inguinal lymphatic glands at the side of the former inoculation greatly swollen, and filled with cheesy pus. The animal was killed, and was found to be affected with general tuberculosis, the cheesy matter of the tuberculous deposits containing the tubercle-bacilli. Comparing my notes on this animal with those of my friend Lingard, we found that on the very day on which I inoculated the animal with my anthrax culture we had inoculated several other guinea-pigs with tuberculous matter. This tuberculous matter was prepared in the same room in which I prepared the fluid for my anthrax inoculation, but the instruments in the two sets of experiments had not been the same.

A rabbit was inoculated with a culture of bacillus anthracis which I did not expect would produce anthrax. The animal remained unaffected with anthrax, but died after four weeks with the symptoms of extremely well-marked tuberculosis—in fact, the best marked case that I have seen—of both lungs, spleen, liver, and kidney. The tuberculous deposits contained the tubercle-bacilli.

Also in this instance inoculations with tuberculous matter had been going on at the same time, when I meant to have inoculated nothing else but a culture of anthrax-bacilli.

I think all these facts taken together prove unmistakably that when working with two contagia in the same laboratory and at the same period, accidental contamination is of no rare occurrence. And this applies with equal force to Buchner's experiments.

Buchner worked extensively with anthrax cultures in the same laboratory, and at the same time he had those successful cases of anthrax in mice which he thought he had inoculated with cultures of hay-bacillus, and accidental contamination probably was the result. Buchner himself has experimentally shown that anthrax virus in the shape of spores can by inhalation produce anthrax, and, therefore, this is another argument against his above-mentioned cases of positive results. I am assuming that his cultures of hay-bacillus were really free of spores of bacillus anthracis; but, seeing that his anthrax cultures were probably contaminated with hay-bacillus, I do not see why, by some chance, one of his tubes which he thought he inoculated with hay-bacillus should not have been accidentally contaminated with the spores of bacillus anthracis, of which there must have been many about in the air of the laboratory.

If Buchner could show us that in a laboratory, in which for some considerable time anthrax cultures, anthrax animals, and examinations of anthrax bacilli had not been carried on, cultivation of hay-bacillus ultimately yields a fluid which produces typical anthrax, then I should be perhaps prepared to concede his proposition of a transmutation of hay-bacillus into bacillus anthracis. Such a proposition is of the widest importance, and therefore its proof ought to be beyond cavil, there ought to be no chance of a possibility of error. Such proof Buchner has not given, and I cannot therefore accept his interpretation.

(To be continued.)

INFLUENCE OF DIET ON HEADACHE.

BY ALEXANDER HAIG, M.A., M.B. OXON., M.R.C.P.

It is no new observation that a dietary largely vegetarian will cure, or at least greatly relieve, the pain, and render less frequent the attacks, of megrim; but, beyond a statement of the fact, I have been able to find but little in the way of explanation, and I therefore venture to think that a history of the following case may be both interesting and instructive, as tending to show that the headache and other phenomena are the result of a poison circulating in the blood, that that poison is a product of the process of digestion of certain foods, especially butcher meat, and that a cure is best effected by cutting off entirely the noxious food, and aiding the elimination of the poison by the kidneys.

A young professional man, somewhat over thirty, residing in London, the child of healthy parents, but with a distinct history of phthisis in certain aunts on the father's side, has suffered from headache as long as he can remember, and has distinct recollection of rolling on the floor in agony with one when about eight years of age. At college they were very troublesome, and have been so since in professional life.

He is active and muscularly strong, but light in build and weight; generally pretty cheerful, but subject to despondency at times when attacks of megrim are impending. He is hypermetropic, and the right eye is also astigmatic, but he has had glasses for these defects for years, as his eyes troubled him a good deal when he first began to read at college, and he had to get glasses then. The history of an attack as experienced in more recent years is generally somewhat as follows: he perhaps wakes in the morning feeling less fresh than usual, and even

his cold bath does not bring him up to the mark: he feels very empty before and shortly after his meals—and especially in winter, but sometimes, even in the heat of summer, he suffers from cold hands and feet. He is much more easily tired than usual, and towards the afternoon there comes a throbbing headache which at its worst is generally occipital, but when less severe may be frontal, or all over the head. When at its worst, it is right in the centre of the occiput, is distinctly throbbing, and greatly increased by exertion or stooping down. If it comes on in the afternoon it gets worse in the evening and towards night, unless absolute rest can be indulged in; and is at its worst when first lying down in bed, when the pain may be almost unbearable. If sleep is at last possible, he may wake free from pain in the morning, or there may be slight pain, which again gets worse as the day goes on.

Pain is never strictly limited to one half of the head, nor is it, except when very bad—and only that about once in a dozen attacks—attended by sickness: but often when pretty bad there is intense coldness of the extremities and slight nausea.

In addition to the cold extremities, uncertain appetite, and easy fatigue already mentioned, there are often for a few days before the attack some irregularity, generally slight relaxation of the bowels, with a good deal of flatus, some pain, heat, or fulness in the right hypochondriac region, and dreams at night, which at other times are very rare. Tongue is clean, or slightly furred and rather red; pulse is slow, and temperature at the normal, or below it. Urine is scanty, and high in colour and specific gravity. There is disinclination for liquids, especially cold liquids.

As to treatment, apart from diet, the drugs found useful were nux vomica (especially useful in improving the circulation in the extremities), sal volatile with quiet and external warmth, and purges, as calomel with colocynth and hyoscyamus pill; but when, as at one time, it became necessary to resort to these last almost every week, they were found too depressing.

I should have mentioned that the attacks were most frequent in the winter months, and during much sedentary mental work, and at these times ranged from one in a week, to one in ten to fourteen days.

It was in the cold season, in the midst of much sedentary work, and having had two or three weekly attacks, that a strict vegetarian diet was first tried, with the immediate result that a whole month passed without any attack, there being no change of occupation or residence during that time. The diet was then continued more or less strictly for six months, through the cold half of the year, with the result that there were only one or two slight attacks in that period. Since then it has been found that a less strict diet will give practical immunity, and at present fish is taken twice a day, and an egg, or bit of fowl or game may be substituted for it. The only thing to be absolutely avoided is butcher meat, one meal of it at a friend's house being sometimes sufficient to bring on an attack. Beer, wine, and spirits, except very occasionally and in small quantities, are bad.

It was also found that two or three tumblers of hot water taken every night at bed-time gave increased immunity, and enabled him to take a little butcher meat occasionally without fear of an attack: the hot water was, I think, specially indicated by the scanty urine and disinclination for fluids, which were marked symptoms.

He found a little difficulty with the hot water at first, but he now takes it with pleasure, and says that he finds it more easy to drink three tumblers of hot water than one of cold.

Such, then, is the case and its history up to the present time; now to attempt an explanation of its symptoms and their cure.

Let us look at the symptoms in groups, and try to give them their true value. The uncertain appetite, slightly furred tongue, pain, heat, or weight in the right hypochondrium, with the excess of flatus and irregular bowels (I should have said that the fæces are at times somewhat deficient in bile, but there is never any jaundice) may be taken as indicating gastro-duodenal catarrh, with some little congestion of the liver. The slow pulse and low temperature seem to point to impurity of blood, and this impure blood will cause the contracted vessels and cold surface and extremities. As for the headache itself, at least when most severe, it seems to me to be due to congestion, the mass of the blood being driven inwards from the surface,

first, because it is worst when lying flat in bed, and better when sitting bolt upright, and second, because getting the surface and extremities warm by the application of heat speedily relieves it. But it may be equally well or better explained by the condition of the arteries observed by Dr. Brunton in these cases, which consists in their being contracted towards their peripheral extremities, but dilated towards the heart, so that a large jet of blood comes forcibly against the contracted point and gives rise to pain; and this would both fit in well with the above-mentioned effects of posture, and also account for the throbbing which is so marked when the headache is severe.

We have then as our central factor the impure blood, which on the one hand causes the headache, and on the other hand is itself due to imperfection of digestive processes.

If additional evidence of blood impurity was wanted, it might be found in the marked relief obtained from the eliminant action of purgatives and diuretics, and the washing out of the tissues and blood by the hot water process; and on one occasion it was noticed that a single one of Martindale's nitro-glycerine tablets sufficed to bring on at once an impending headache, possibly by preventing oxidation, which nitrites in the blood have been shown by Gamgee to do, and so making the blood still further impure.

As to the nature of the impurity in the blood, and its connection with the digestion of meat, there is no doubt that more than one explanation is possible; but I think some hint as to the direction in which it is to be looked for may be found in the following passage in the fourth edition of Dr. M. Foster's *Physiology*, p. 298:—

"Possibly also in the intestines, as in the laboratory, this pancreatic digestion of proteids in excess is accompanied by a considerable development of bacteria and other organised bodies, which create trouble by inducing fermentative changes in the accompanying saccharine constituents of the chyme."

Possibly the poison may be the result of some such fermentation, which it will doubtless be admitted may be more easily induced in some individuals than in others: for it is matter of daily experience that different patients react very differently to the same drug; and among foods, such as oatmeal, of which I

daily consume a large quantity, I know some individuals in whom the smallest quantity in their food is sufficient to induce an attack of urticaria.

Or if a more potent poison is required, in a recent article in *Le Progrès médical*[1] it is asserted that alkaloids are formed in the intestines during digestion similar to those that have been found in the cadaver, that these are excreted in the fæces and urine, and that if from any cause they are absorbed in excess or insufficiently excreted by the kidneys, they give rise to toxæmia, and are the cause of the group of symptoms now called uræmia, and of the toxæmia of constipation and of certain infectious diseases, especially that of typhoid fever.

I think the history of this case clearly points to some such poison as the cause of the headache, and that the gastro-duodenal and hepatic symptoms, slight though they be, are the indices of what is going wrong in the process of digestion, and of its primary seat: that a very little butcher meat is sufficient in this particular case to give rise to such changes is merely an example of a well-known law—it is, in fact, a very literal application of the saying that "one man's meat is another man's poison."

I am quite aware that there exist in the case as above related several of the ordinarily recognised causes of megrim, as hypermetropia and astigmatism, but the attacks never seemed to present any relation to the use of the eyes, and for many years past these defects have been counteracted by the use of suitable glasses. The headaches were very severe and frequent at college, but they were so at a time when the patient was doing more rowing than reading: but being in a sort of training for this exercise, he was eating largely of butcher meat three times a day. His teeth are by no means above the average; but again the headaches have extended over many years, with varying conditions of teeth, and quite irrespective of facial neuralgia or toothache, from which he has suffered, and of visits to, or absence from, a dentist: and against both of these, as possible causes, stands the fact that teeth and eyes remain unaltered, while a change of diet has effected a cure.

That the attacks were always less frequent in summer than

[1] 31 Mai, 1884.

in winter I attribute to the increased proportion of vegetables and fruit to the rest of the food, and the increased facilities for oxidation and elimination during the outdoor exercise of the former season as compared with those of the latter.

Whether this is the whole explanation or not, the fact remains that this young man was for many years a martyr to headaches, and at times professional work and reading made life so much a burden that he had thoughts of giving them up entirely; and all this in spite of advice and drugs, of which at one time he had plenty. Now he has been on this altered diet, from which butcher meat is conspicuously absent, for about eighteen months, and he has been practically free from his tormentor in spite of much sedentary work. He was unfortunately not weighed at the time the altered diet was begun, but he has not lost weight compared with what he was between two and three years back, and he is as active and feels as strong as at any period in his life.

It may be objected that megrim is known to get better in those who suffer from it after they reach the age of thirty, and that the alteration of diet was a mere coincidence; but that this has little or nothing to do with the result is, I think, shown by the remarkable way in which improvement immediately followed the change of diet, and by the fact that an attack can still be brought on by a return to butcher meat.

BILIOUSNESS IN BLOOD-POISONING.

BY C. R. FRANCIS, M.B., SURGEON-GENERAL H.M. INDIAN ARMY.

A CASE of fatal diphtheria has recently occurred within my own knowledge, though not under my care. A young unmarried lady, of considerable mental culture and active habits, but of strumous constitution, complained one day of so-called biliousness, and was treated accordingly. On the day following her throat felt uncomfortable, the discomfort being accompanied by dysphagia. On examination, the tonsils were found to be considerably enlarged, and simple cynanche tonsillaris was diagnosed. Twenty-four hours subsequently diphtheria was developed; and in forty-eight more, or in ninety-six hours from the commencement of the attack, the patient was dead.

The case presents, I think, the following noteworthy points:—

1. The feeble resistance offered by an apparently healthy, but really delicate, frame to the invasion of a virulent and quickly acting blood-poison.

2. The rapid development of what seemed to be a simple disease into a specially dangerous one.

3. The effort of nature to eliminate the poison by the liver.

Some years ago Dr. Peter Hood published a book on the treatment of scarlatina, in which he urges the *early* use, in *all* cases of this disorder, of quinine, together with other suitable remedies; a treatment under which, he adds, his cases have all terminated favourably. His theory is that the concomitant sore throat, which promises to be mild, *may* develop into a severe type of the same disease, or even into diphtheria itself. A case confirmatory of Dr. Hood's view occurred in my own practice, at one of the Himalayan Sanatoria, in 1856. A child, twelve years of age and markedly strumous, was attacked with what was diagnosed as simple cynanche tonsillaris; and, for two or three

days (as I was informed, for circumstances had caused me to leave the station for a time), there was nothing remarkable about the case, which promised to terminate favourably. One morning, however, on paying the usual visit, the medical officer noticed a change for the worse. A bad form of sore throat—diphtheritic pathology was not so well understood thirty years ago as it is now—had succeeded to the simple cynanche; and in forty-eight hours more the little patient was dead.

On resuming charge of the station, a day or two afterwards, I received, late on the evening of my return, a note from the mother—the wife of an Indian officer—in which she said that Lucy, a younger sister about three years of age, seemed to be bilious; and asked me to see her in the morning. I ordered my pony, and went over at once. Calling for a light and a spoon, I looked into the child's throat; and, as I expected, found it affected. The tonsils were not enlarged, but they were covered with grey, ash-coloured, deposits. Within a week this little one also died. She had been allowed to kiss her sister within a few minutes of the latter's death. The family were all more or less strumous; but these children were especially so. The mother and a European servant were also attacked with diphtheria, but recovered. More cases occurred in another part of the station, but there were no more deaths. I now,—and I have followed the practice ever since I became acquainted with Dr. Hood's views—whenever summoned to a case of sore throat, however simple it may appear (unless indeed it be a case of *specific* origin), invariably give full doses of quinine, or other nervine tonic, with as much nourishment as the stomach will bear: and, whatever might have been the result under other treatment, with this it has been eminently satisfactory.

With regard to the so-called biliousness in cases of blood-poisoning, it is, I venture to think, a symptom of the greatest value, being evidently a conservative effort of the system to eliminate the poison through nature's chief emunctory—the liver. Gaspard and Fontana proved, by their experiments, that all poisons find their way to this organ and there create an increased secretion of bile,[1] with which they become intermingled.

[1] All poisons are not eliminated by the same channel. Thus, that of small-pox finds its way to the skin and lungs; that of scarlet fever to the throat,

It is a familiar symptom early in erysipelas and some other forms of blood-poisoning; and the worst cases of cholera are occasionally ushered in in this way. A bilious attack is not an unusual form of disorder in the hot weather in all countries, and under ordinary circumstances would attract no special notice. A mild aperient, with attention to diet and hygiene, would probably soon rectify the derangement. But, if there be cases of blood-poisoning in the locality or neighbourhood, the question would at once arise, "Is this one?" But, supposing it to be so, what do we gain? To begin with, we gain *time*. This in itself is an immense advantage, as we at once commence to use the remedial measures adapted for such cases, and to fortify the system in the event of the attack assuming an unfavourable character. But, may we not utilise the hint given to us by this action of the poison on the liver, and endeavour to eliminate the former as completely and as rapidly as we possibly can through that channel? Are we to wait till the poison has stamped its characteristic features on the system—be it diphtheria or scarlatina, small-pox or puerperal fever, &c., &c.—and do no more than enable it to sustain, as best it can, the working of the poison until the latter has passed away, supplementing this treatment by antiseptics to modify its virulence *en route?* I once, in India, had under my care a severe case of small-pox in a young officer, in whom the first symptoms were distinctly hepatic; indeed, I imagined he was about to have a sharp attack of hepatitis. Calomel was the fashion in those days, and I gave him a scruple. I remember being much struck, at the time, with the great relief that followed the action of the mercurial, succeeded by an aperient; so much so, that I regretted afterwards not having continued the treatment on these lines.

Mercury is undoubtedly a ticklish drug to give in blood-poisoning, but possibly the poison itself is in some cases cholagogue[1] sufficient; and the end might then be answered by

kidneys, and skin; that of diphtheria chiefly to the throat, lungs, and kidneys, leaving the skin. But if the liver *can* be utilised to eliminate some, at any rate, of the poison in each case early in the attack, do we not steal a march, as it were, upon the enemy?

[1] Although we could not hope to get rid of all the poison in this way, we might remove a portion—perhaps a large portion—of it. I should not myself hesitate to give, unless it were specially contra-indicated, a full dose of calomel early in

a judicious, but free, use of quickly acting aperients.[1] Otherwise, the poison brought with the bile into the intestinal canal might be, and no doubt is—some of it, at any rate—reabsorbed into the circulation.

One word more with reference to the value of oxygen gas in cases of blood-poisoning. When I was Staff Assistant-Surgeon at the E. I. Company's depot of all arms at Warley, in 1858, a young recruit was dying in hospital from a severe attack of malignant scarlatina. The occasional inhalation of oxygen gas, however, revived him, so that remedies and food were enabled to do their office: and he eventually recovered. The case was published in the *Lancet*, March 12th, 1858. One great objection to the use of oxygen is its expense; but this has to a great extent been obviated, especially for practitioners in and near London, by Messrs. Armbrecht, Nelson, and Co., 23, Duke Street, Grosvenor Square, who supply the apparatus on hire for 15*s*. a month; exclusive of the oxygen itself, which is charged for at the rate of 5*s*. for 120 pints. Instructions for use are furnished at the same time. The cost of an apparatus, complete, is 6*l*. 6*s*. To insure the arrival of the oxygen into the lungs, a little careful manipulation is necessary, or it may not get beyond the back of the mouth. The lungs should first be emptied by a long expiration: the nasal orifices being then closed by the thumb and forefinger, let the patient, after placing the glass piece in his (or her) mouth, and fixing the lips firmly round it, the tap in the inhaling tube being now turned, draw a long breath. From my own experience of this remedy I cannot but think that, if it were more extensively tried in cases of blood-poisoning, the results would, *cæteris paribus*, add greatly to its reputation. But its use must not be postponed. It ought to be employed early.

the attack, followed, perhaps, by another smaller one. Salivation must, of course, be avoided.

[1] This practice, although in keeping with that advocated by Dr. Johnson in cholera, is diametrically opposed to the treatment which is acknowledged by all practical physicians to be the most efficacious in that disorder. It seems inconsistent to eliminate a poison in one disease and to retain it in another. But —the comma bacillus notwithstanding—we do not yet know the exact pathology of cholera.

Reviews.

A Practical Manual of Diseases of Women and Uterine Therapeutics for Students and Practitioners. By H. MACNAUGHTON JONES, M.D., &c. London: Baillière, Tindall, and Cox. 1884.

THIS somewhat slight manual contains the usual information on the diagnosis and treatment of the more common and generally-known diseases of women, together with some sound practical advice to practitioners on whom the grave responsibility may come of giving their assent to the performance of the rather frequently proposed, and in many cases very dangerous, modern operations. It is in the more difficult portions of the subject that the book is deficient, and in our view fails to arrive at the not very high standard it aims at. Such subjects, for instance, as peri-metritis, para-metritis, and ovaritis, which are amongst the commonest, most severe, and, speaking generally, readily-curable diseases of women, require a totally different method of description to enable a student to grasp the principles of their course and treatment. There is more excuse in the case of such subjects as endo-metritis which require a complete re-investigation, clinically and pathologically; authors have fallen into the habit of entering more fully into the subject than our knowledge warrants, in order to give an appearance of completeness to their descriptions. The author whilst agreeing with the well-known views of Dr. M. Duncan as to the importance and treatment of minor displacements, fails to give the reader any clue as to what constitutes a minor and what a grave displacement, and leaves him under the impression that every flexion and version of the uterus requires a pessary, and that vaginal pessaries can do much to modify the position of the uterus in the pelvis. The book contains a large number of illustrations, chiefly of instruments. That of the vulva on one of the early pages, being copied from Gray's *Anatomy*, contains (as does also, by the way, the first volume of Barnes' work recently reviewed) an anatomical error. The "fossa navicularis" is the large space between the

hymen and the fourchette. No such space exists as that drawn between the fourchette and the posterior commissure.

Elements of Human Physiology. By HENRY POWER, M.B., F.R.C.S. Small 8vo, pp. 389. London: Cassell and Co. 1884.

THIS little book will no doubt spring at once into general use among students of medicine. The matter it contains is simply put and clearly arranged, and the book is in a high degree both condensed and full. It will probably justly supersede the manuals now for the most part used by candidates for the membership of the College of Surgeons and similar qualifications, and its use may do something towards raising the standard of such examinations. While thus according full praise to Mr. Power for the manner in which he has performed his very difficult task, we cannot refrain from a few remarks on little manuals in general. In some subjects a little book is likely to be a greater evil than a big one, and physiology is, we think, one of these. In a little book much that is doubtful has to be represented as certain, much that is vague or approximative has to be expressed in precise statistical form, and very much that is of high theoretic or philosophic interest has to be left out altogether. The student who has done nothing but commit such a book to memory knows nothing of the open questions of physiology, of the tendencies of current research, of the doubts that surround many unqualified assertions. He conceives a picture of simple mechanism where all is really complex, and accepts without a critical thought matters on which opinion is changing every day. We cannot but think that a great amount of the interest and attraction, and an immense part of the educative value of the science to medical students, is lost in this way. It may be extremely convenient for an examiner that students should have presented to their memories a large number of categorically stated facts; but we should be sorry to see a beginner draw his first, still less his only, idea of the scope and measure of physiology from a mere sketch however able, or a candidate for the college fellowship or a higher university examination be helped to success by an uncritical mastery of its contents.

As instances of the unfortunate precision which the small size of Mr. Power's book renders unavoidable, we may cite the statement that the submaxillary ganglion acts as a reflex centre for the innervation of the submaxillary gland (p. 104), or the assertion that "painful impressions enter through the posterior roots and travel upwards through the grey substance generally" (p. 250), and the other statements in the same paragraph concerning the paths of impulses in the spinal cord, which seem

to be taken direct from Landois. And as an example of an almost unqualified expression of opinion, with which all physiologists would certainly not agree, we may take the account of the origin of urea (p. 168). A student would surely draw a too confident assurance from such passages as the following, even though other views are not omitted: "It is natural to suppose that, as the liver secretes bile, or the parotid glands saliva, the kidneys form urea; and it is to be observed that they receive an unusually large supply of oxygenated blood, so that it is not improbable that oxydising processes take place with activity in their cells. . . One or two observers have, however, noticed that the quantity of urea in the blood after ligature of the ureters is much greater than after ablation of the kidneys, which supports the view that the kidneys themselves aid in its production."

The prospectus of the series to which this book belongs mentions as a prominent feature—"the introduction of the results of the latest scientific researches," and "the treatment of new subjects that have not yet been systematically handled." But Hammarsten is not mentioned in the account of the coagulation of blood, and Gaskell's name only occurs in an unimportant parenthesis in the account of the nervous mechanism of the heart. We have mentioned these drawbacks because we consider them inseparable from a book of this class: that they are not far more numerous is entirely to the credit of the author's skill and knowledge. In the excellent chapter on the eye, Mr. Power's own personality comes out to the student's advantage.

A New Method of Treating Chronic Glaucoma, based on Recent Researches into its Pathology. By GEORGE LINDSAY JOHNSON, M.B., Cantab. London: H. K. Lewis. 1884.

IN this little volume a very creditable attempt is made by a young Cambridge graduate to suggest a remedy for chronic glaucoma. The author starts with the proposition, "that the ordinary method of treatment for glaucoma by iridectomy, though highly successful in acute forms of the disease, is nevertheless both uncertain and unsatisfactory in the chronic condition of glaucoma." The correctness of this statement, there can be little doubt, will be acknowledged by all who have had large opportunities of practising iridectomy. Dr. Johnson then proceeds to consider the pathology of glaucoma, and after commenting upon the importance of taking into consideration the degree of tension of the globe of the eye in the diagnosis of the disease, and the singular circumstance that it was so long overlooked, points out that it is occasioned by one of three circumstances, either (1) by vaso-motor nerve-

influence, leading to alteration in the calibre of the vessels and increase in the rate of secretion; (2) by acute inflammation or passive hyperæmia of the ciliary body and tunica vasculosa; and (3) by contraction or occlusion of the lymphatic waste channels, whereby the outflow of lymph is retarded. The last-named he with the majority of pathologists regards as the usually acting and efficient cause of glaucoma, and he has constructed a good diagram of the course of the lymph in the eye and of its mode of escape. That it is not true lymph, if by that term is meant the liquor sanguinis, is of course obvious enough, but there is every reason for believing that as in the case of the epithelium covering the glomeruli of the renal vessels, the epithelium covering the iris and ciliary processes is capable of exerting a selective action on the constituents of the blood which are allowed to escape.

In the second part of his thesis Dr. Johnson adduces the evidence to show that in cases of glaucoma pathological conditions are present which individually and collectively tend to retard the escape of the aqueous humour, if not to stop the flow altogether; and from an analysis of eighty-eight cases examined at Moorfields he finds that the angle of the anterior chamber was closed by contact of the iris with the cornea in no less than seventy-nine cases, whilst in twenty-two cases there was excessive turgidity of the ligamentum pectinatum and ciliary processes; in thirty-two cases there was slight turgidity of the same parts; and in sixty-nine cases there was more or less sclerosis of the ligamentum pectinatum and ciliary muscle, with some atrophy.

The reduction of the corneo-iridal angle, Dr. Johnson then points out, might be attributed to the increase in the size of the lens, which Mr. Priestley has shown occurs with advancing age, were it not that Dr. Brailey has demonstrated that the size of glaucomatous lenses is rather decreased than increased. He therefore turns to another pathological condition which is frequently present as the immediate cause of the symptoms in glaucoma, namely, swelling up and enlargement of the ciliary processes, and to this cause he thinks may be superadded the sclerosis of the minute arteries described by Angelucci.

The method of treatment suggested by Dr. Johnson in cases of chronic glaucoma is to place the patient on his back with the head slightly raised, to open the lids with a spring speculum, and fix the eye with forceps, turning it inwards as far as possible; a double-edged Wenzel's knife is then entered 4 mm. behind the scelero-corneal junction and made to penetrate 10 mm. into the vitreous, the side of the instrument lying not quite parallel but somewhat oblique to the long axis of the eye. The knife is then slowly withdrawn. Dr. Johnson states that

he has operated in six cases himself, and has seen it performed in about ten more, and that the effects have been satisfactory.

Dr. Johnson states that his operation "differs from any of the old operations" and in particular from Mr. Hancock's division of the ciliary muscle, but as a matter of fact the writer of this notice has repeatedly seen Mr. Hancock and his colleague Mr. Power perform on patients in the Westminster Ophthalmic Hospital an operation in all respects identical with that described by Dr. Johnson, even to the "very slow" withdrawal of the knife and the slight turning of the knife "on its axis, in order to allow the lymph freely to escape." We entertain no doubt, however, that Dr. Johnson's modification of Mr. Hancock's original operation has been fairly rediscovered, and adopted from his own views of the pathology of the disease. We only fear that as Dr. Johnson's experience becomes larger he will be less sanguine in regard to its beneficial results. We hold that the method is of signal value in recent and in fulminating cases of glaucoma, but that it is of very doubtful value if not altogether inefficacious in old-standing forms of the disease and in those which are occasionally seen in young persons.

The Non-bacillar Nature of Abrus-poison. By C. J. H. Warden, Surgeon I.M.S., and L. A. Waddell, Surgeon I.M.S. Calcutta: 1884.

The theory that the infusion of the seeds of *Abrus precatorius* (jequirity) owes its power of producing ophthalmia to the action of a bacillus, the famous jequirity-bacillus, has by this time no doubt been abandoned even by its first propounders (Messrs. de Wecker and Sattler). Messrs. Warden and Waddell in this careful tract conclusively prove that the abrus-poison, or *abrin*, is a proteid closely allied to ordinary albumen, that it is insoluble, and is present not only in the seeds but also in the stem and root of the *Abrus precatorius*. They further show that abrin produces its poisonous effect when injected subcutaneously, but not when ingested [cf. *Practitioner*, xxxii. 135, 437].

Clinic of the Month.

Fœtal Rachitis.—Dr. Bode writes as follows on a case which was demonstrated before the Dresden Gynæcological Society in 1881:—"The mother of the fœtus showed no evidence of rachitis, and only a moderate development of struma. Labour occurred six or eight weeks before the full term of pregnancy. The diagnosis of rachitis was confirmed by microscopical investigation of the fœtal skeleton. The distinguishing characteristic in this particular specimen, which illustrated what is known as the micromelic form of rachitis, is a disproportion between the head, breast, belly, and extremities, the head being very large and hydrocephalic, the thorax short and narrow, and the extremities crooked, small, and puny. It is usual to find the lungs and heart small in such cases, the thymus, thyroid, and liver large, the uterus and kidneys also large. The spinal column may show either skoliosis, lordosis, or kyphosis. The diaphyses are usually short, the epiphyses greatly enlarged. The flat bones are thick, often very porous, and provided with large nutrient foramina. This form of rachitis is to be differentiated from *rachitis annulans*, a congenital disease, which differs also as to its period of invasion and its duration. It appears at the latter part of pregnancy, and continues after birth; the micromelic variety begins early in fœtal life, and ends before birth. *Rachitis annulans* is diagnosticated by ring-like enlargements upon the bones and multiple fractures. The rings may be due to fractures which have healed, or to unequal deposits of bony *matrix*. The cause of this peculiar condition may be the superposition of the relatively heavy trunk upon a pelvis which is too weak, irregular muscular contractions, or some other agency not as yet ascertained. *Hydramnios* has been found associated with this disease in several cases. Finally, the disease may be due to syphilis, rachitis, struma, tuberculosis, &c., in the parents. It is to be noted that different processes may produce the same results in different cases. What these processes are is not yet definitely known." (*Virchow's Archiv*, 3, vol. xciii.) Dr. Gueniot reported an analogous case to the Paris Society of Surgery at

its sitting on December 19, 1883.—The bony lesions of the disease seem to have entirely healed, though the previous existence of the disease was undoubted. A careful examination of the father, mother, brother, and sister of the infant by the author, assisted by M. Fournier, failed to reveal the least trace or history of syphilis. Hence the opinion is justifiable, in the author's mind, that rachitis may exist without any syphilitic taint. This is contrary to the view which was promulgated and defended by Parrot. (*Revue Mens. des Malad. de l'Enfance*, Jan. 1884.)

Nephritis after Varicella.—In a recent number of the *Berliner klinische Wochenschrift*, Professor Henoch relates briefly four cases which have come under his notice in which varicella was followed by nephritis. The patients were aged respectively ten, two, five, and four years. In all, the eruption of varicella was generally abundant, and was accompanied by fever; and, at the end of a period varying from eight to fourteen days from the appearance of the eruption, there was œdema, with nephritic urine. In three of the cases, recovery took place in a few weeks, under the use of diaphoretics, with Bilin water or acetate of potassium as a diuretic. One, a girl aged two years, who was the subject of congenital syphilis, died; and after death there were found œdema of the lungs and hypertrophy of the left ventricle. Dr. Henoch has not been able to find any record of varicellar nephritis in medical literature. He regards it as analogous to the nephritis which attends other infectious diseases, especially scarlatina. (*New York Med. Record*, April 26, 1884.)

The Diagnosis of Typhus Fever.—Dr. A. Randolph Mott gives an analysis of 108 cases which were mistaken for typhus fever and sent as such to the Riverside Hospital, New York, during a period in which 771 cases of typhus fever were treated there. These patients had been seen by one or more physicians, and in certainly half the number the unqualified diagnosis of typhus fever was made; the rest were considered to present symptoms sufficiently suspicious of this disease to warrant isolation for further development, and were therefore admitted to the quarantine wards of the hospital. The revised diagnosis showed nearly every disease which writers mention as liable to be confounded with typhus fever; and the frequency with which any disease was mistaken does not indicate the comparative closeness of its resemblance to typhus. Thus, there were three cases of erythema, and but one of measles, yet all writers declare that the latter is sometimes distinguished from typhus fever with much difficulty. Dr. Mott makes a very instructive analysis of the symptoms which led to the errors of diagnosis, which, in the case of small-pox, for instance, caused 8

cases to be sent to the hospital as typhus, and 13 cases of typhus to be sent as small-pox; and in the case of typhoid fever, 2 cases proved to be typhus, while 12 cases of supposed typhus turned out to be typhoid. (*American Journal of the Medical Sciences*, April 1884.)

Disseminated Sclerosis.—The study of a case of disseminated sclerosis which, in its clinical features, closely simulated lateral amyotrophic sclerosis, has given M. Déjérine the opportunity of making some interesting and valuable remarks on the pathology of scleroses in general. The case which forms the starting point of the paper was that of a woman, aged forty-six years, who had had for fourteen months atrophic paralysis, with contracture of all four limbs. The disease commenced in the legs, spreading thence to the arms, and ultimately to the lower part of the face; the paralysis of the limbs became absolute, and the atrophy extreme; it was throughout symmetrical. An interesting feature of the case was the high degree of contracture which was present; so great was it that it could not be altogether overcome by the employment of force; the tendon reflexes were highly exaggerated. The general and special sensibility was unimpaired; but towards the end there were some symptoms of labio-glossal paralysis. At the autopsy it was found to be a case of disseminated and not of lateral amyotrophic sclerosis. Spinal and cerebral scleroses, M. Déjérine goes on to say, may be and ought to be divided into primary when the neuroglia is affected from the outset by the irritative process, and secondary when it is only the result of the nerve disorder. In disseminated sclerosis the affection of the neuroglia is primary, as is shown by the fact that the nerve tubes and axis cylinders disappear very slowly from gradual compression by the contracting neuroglia. In tabes dorsalis, the contrary is seen; for the axis cylinder disappears before the neuroglia has commenced to proliferate. Disseminated sclerosis, then, and probably all forms of non-systematic sclerosis, have a vascular origin; whereas, in systematic sclerosis, the vascular lesions which are present are secondary. Thus, in a case of hemiplegia, fatal just when rigidity was setting in, the vessels of the pyramidal fasciculus were already found to be undergoing endo- and peri-arteritis, and their lymph sheaths were distended with corpuscles; but the nerve tubes showed a much more advanced state of degeneration, the axis cylinders having already disappeared, and the neuroglia showing traces of irritation at a point far removed from the vessels, contrary to what takes place in non-systematic sclerosis. The vascular origin of the patches in the latter explains both their scattered distribution and the absence of any tendency to spread in a systematic manner. (*Revue de Médecine*, March 1884.)

Micro-Organisms in Endocarditis.—Dr. Cayley, at the Medical Society, read notes of an interesting and unusual case of so-called ulcerative endocarditis. The disease ran its course in about eight days, supervening on old rheumatic heart disease. Dr. Heneage Gibbes had examined the organs microscopically for micrococci, and found abundant evidence of their presence. Dr. Cayley was unable to account for their mode of entrance into the body, as the man had not been subjected to any known source of contagion. He discussed the significance of micro-organisms in these cases: they must have been present within the body, but probably had only become operative when the patient's health began to give way, and his tissues were no longer able to resist their septic effects. He considered the term "ulcerative" as inappropriate for many cases, as also for his own, because there was no ulceration present. There was often difficulty in diagnosing such cases from typhoid fever, as the temperature curve much resembled that found in the latter disease. Dr. Green rather ridiculed the idea of such cases being mistaken for typhoid. He seemed to argue that the micro-organisms were the essential cause of the disease. Dr. Coupland, it will be remembered, contributed to our columns, about two years ago, some very well-marked cases, with temperature curves, which he considered almost characteristic of the septic form of the disease. The subject is one of great interest to physicians, surgeons, and pathologists alike; apart from the difficulties of diagnosis, there is also the still more obscure question as to the mode of entrance into the body of the micro-organisms which add so much to the danger of the disease. How do they find entrance to the endocardium, and why, as an initial lesion, do they commence operations by attacking the vegetations found on certain diseased valves? The full significance of these germs can only be determined by carefully conducted inoculation experiments. Meanwhile, in suspected cases, in cases of old heart disease in which acute septic symptoms suddenly come on, let a wary diagnosis be given. (*Med. Times*, May 3, 1884.)

Sublimate Inhalations in Putrid Bronchitis.—Professor Korányi reports a case of right pleurisy and mitral insufficiency in which putrid bronchitis was subsequently developed. Inhalations of carbolic acid and turpentine were used for four weeks, but caused no change in the character of the sputa. Korányi then used a solution of corrosive sublimate (gr. $\frac{1}{6}$ to water f ℥iij), of which ʒv were inhaled every morning and evening. In a week the patient was free of fever, coughed less, and the sputum was much less foul, and after a few days it was odourless. (*Centralbl. f. d. gesammte Therap.*, Feb. 1884.)

Galvanopuncture in Aneurysm of the Aorta.—Dr. Francesco Brancaccio reports the case of a man, æt. 64 years, of intemperate habits, who complained of pain in the left anterior part of the chest, over the base of the heart, which radiated to the shoulders. The pain came on suddenly after a muscular effort, and was intermittent. Examination revealed a tumour, limited above by the upper border of the second rib, on the right by the sternum, on the left by the mammary line, and below was continuous with the heart. The diagnosis of aneurysm of the ascending portion of the aorta having been made, it was determined to practise galvanopuncture. A fifteen-cell Daniell's battery was used, two needles being carried into the sac through the third interspace to a depth of one inch and one-fifth, and an inch and a half apart. The first sitting lasted sixteen minutes. In the afternoon the patient felt better, the tumour was smaller, the pulse, which had fallen from 118 to 90, was stronger, and the respirations were less frequent. Twenty days afterward the battery was again used, with twenty elements, for fourteen minutes. Altogether it was used four times, and the patient was completely cured. (*Revista Internaz. di Med. e Chir.*, Feb. 1884.)

Therapeutic Uses of Lobelia.—In a recent communication to the Société de Thérapeutique Dr. Fournier states that he has successfully used the tincture of *Lobelia inflata*, in doses of ♏xv–xxx, in several cases of cardiac dyspnœa, and in two cases of pulmonary congestion, and with good results in the third stage of phthisis. As lobelia alone is nauseating, it should be combined with polygala. Huchard uses the following formula, which is well borne by the patient:

℞	Iodide of potassium . . .	ʒij.
	Alcoholic tinct. of lobelia.	
	Alcoholic tinct. of polygala . .	āā f ʒij.
	Extract of opium	gr. iss.
	Distilled water	ad f ℥viij.

Dose, a tablespoonful morning and evening in chronic bronchitis and asthma.

M. C. Paul has used lobelia and iodide of potassium with success in catarrhal asthma, giving ♏xx of tincture of lobelia to gr. viij of iodide of potassium. (*Revue de Thérap.*, March 1884.)

Traumatic Aneurysm of the Vertebral Artery.—Dr. R. F. Weir reports a case of traumatic aneurysm of the right vertebral artery high up in the neck, which is interesting not only on account of the rarity of the lesion but from the fact that Dr. Weir succeeded in effecting a cure by digital compression

over the lower and anterior edge of the sac in seven hours. Dr. Weir tabulates eight similar cases, in which the error was committed of ligating the carotid artery. All proved fatal. He also refers to the case of Möbres, cured by the application of cold after pressure on the exposed external carotid had produced no effect on the tumour, and to that of Kocher, cured by graduated compresses of carbolised gauze acting on a pledget of lint, dipped in perchloride of iron, and pressed into the space between the transverse processes of the fifth and sixth cervical vertebræ. Hence, in the two cases in which the diagnosis was made, digital compression and direct compression have proved successful. The great difficulty is in arriving at a correct diagnosis, which, Dr. Weir says, may be done by "carefully considering the effect of pressure on the carotid, not only above, but also on a line with the transverse process of the sixth cervical vertebra, or rather over the anterior or so-called carotid tubercle. Compression above this point affects, as a rule, the carotid artery only; over and below the transverse process compression will not only occlude the carotid but also the vertebral artery, which runs to its outer side. It must be remembered, however, that the vertebral, instead of entering the foramen in the transverse process of the sixth cervical vertebra, in its upward course sometimes remains exposed until it enters a higher foramen. To meet such possibilities, it has been suggested to isolate the carotid according to Rouge's plan. which is, with the sterno-mastoid relaxed, to grasp the muscle with the finger and thumb and to pinch the carotid between them. It is necessary also to keep in mind, in trying to effect vertebral compression, that the carotid tubercle is, according to Chassaignac, always from two to three inches above the clavicle. A traumatic aneurysm whose pulsations are unaffected by compression of the carotid applied as above detailed will be found to concern the vertebral artery." In the treatment, ice and compression by bandages or the fingers having failed, the sac should be opened, the finger applied to the wounded artery until the clots are cleared away, and firm antiseptic plugging be resorted to, as was successfully done by Kocher in a case of aneurysm, and by Kuester in two examples of wound of the artery. (*Archives of Medicine*, April 1884.)

Treatment of Ununited Fractures of the Tibia.—After referring to the difficulties of treating these cases when they are the result of severe and complicated fractures, Dr. Hahn points out that they usually either come to amputation. or the patient is condemned to use crutches for the rest of his life. The ordinary methods of treating ununited fractures ordinarily fail, hence the operation which he has devised, which

consists in cutting through the fibula, and implanting its lower fragment into the upper fragment of the tibia. Only in one case has it been tried so far, and it has succeeded admirably. The patient entered the hospital on May 13, 1883, on the 24th was put up in plaster of Paris, and in the following April (1884) was able to get about with a high boot. He was shown at the Surgical Congress April 18, and pronounced to be quite well. There was scarcely any movement of the lower fragment of the tibia. Dr. Hahn suggests that in any future case he should propose to cut the lower end of the tibia obliquely so that it might more readily help to strengthen the fibula by joining with it. (*Centralblatt f. Chirurgie*, May 24, 1884.)

Leucoderma Syphiliticum.—Under this name a peculiar appearance of the skin is described. It consists of certain white patches, which sometimes remain quite small, like papules, or may increase, and even coalesce so as to assume a confluent condition. In dark-skinned individuals they appear as white patches surrounded by a dark network. They are almost invariably situated on the neck, rarely on the back, scapular region, and chest, and more rarely still on the limbs and their extremities. This condition is ten times as common in women as in men. The spots usually appear from the fourth to the sixth month after infection, and usually last from five to fourteen months, rarely longer; but have been known to remain two, three, or even four years. Neisser (who writes) has seen over a hundred cases, in all of which their direct connexion with syphilis was traced. They appeared in the site of patches of roseola and papules, and seemed to be formed by a sort of inflammatory process, and to be attended by a rapid heaping up of epithelium. No explanation is at present offered to account for their appearance in certain cases, and not in others. (*Vierteljahrsschrift für Dermatologie und Syphilis*, 1883, p. 491.)

Coccygodynia.—In exhibiting a carious coccyx which he had removed from a patient who had manifested all the classical symptoms of a very bad coccygodynia, Dr. Goodell referred to two other cases of the mimetic variety of the disease. To one patient, who suffered from very exacting coccygeal symptoms, an operation was at length proposed. As soon as the day and hour were fixed, she lost all pain in the coccyx, and had suffered no return of it during the last six years. Another very obstinate and severe case, which had a traumatic history, and which had been treated for a long time unsuccessfully, quickly disappeared under the influence of an exciting family jar. (*New York Medical Journal*, March 15, 1884.)

Extracts from British and Foreign Journals.

Chemical Incompatibilities.—Dr. Henry Leffmann writes in a paper read before the College of Physicians of Philadelphia: The few points that I present to the College this evening will include little that is absolutely new, but I think the time will not be entirely wasted, as I know that the prescription list of most of our drug stores will give numerous examples of the violation of chemical principles here mentioned. My attention was called to this topic by my being shown by an apothecary a prescription calling for syr. hypophosph., tinc. ferri chlor., acid. phosph. dil., concerning which he said that in the proportions ordered he could never make the mixture up clear. I examined the precipitate, and found in it, as I had expected, a large proportion of the iron and other basic ingredients. This is a simple case of incompatibility. Turning the matter over in my mind, it has seemed to me that while some attention is paid to cautioning students as to the general nature of incompatibility, very little or none is given, especially in the shallow chemical teaching of many medical schools, to the properties and qualities of chemical substances in their relations to the animal tissues and the manner of administration. I present here, therefore, a brief consideration of a few well-known remedies. Under the name of *colourless tincture of iodine* several preparations are used, depending for their popularity on the fact that they do not stain the skin. They are prepared either by the use of ammonia or of sodium sulphite or hyposulphite. They owe their particular property, or rather absence of property, to the neutralisation of the iodine, and just to the extent that the iodine is decolorised is it to the same extent deprived of virtue. The free active affinity of the iodine, to which its local action must be due, is destroyed in these preparations, and the destruction is not slow or uncertain, but in two of the methods mentioned it is sufficiently rapid and definite to be made the basis of a method of quantitative analysis. It is certainly difficult to see how any person could go so wide of simple chemical principles as to invent or employ this mixture. *Potassium chlorate*, or, as it is still erroneously called by many, chlorate of potash, is a remedy concerning which extraordinary claims have been made, based upon most erroneous notions of its chemical qualities. It is employed in

the laboratory as a source of oxygen. Knowledge of this fact has led to its employment as an oxidising agent in diseases which have been supposed to express deficient oxidation. I have nothing to say here as to the clinical results obtained from potassium chlorate in any disease—although I believe it is much less in favour than formerly—but I enter a protest against any advocacy of its usefulness as an oxidising agent. Under temperatures and conditions such as those which it meets in the human system it is one of the most stable of bodies, does not part with its oxygen or chlorine, and, indeed, will not begin to do so except under very high heat. I have found by actual experiment that ten grains of the salt kept for two hours at a temperature of 100° F. in contact with an artificial gastric juice did not develop oxidising qualities sufficient to oxidise one sixtieth of a grain of phosphorus. This experiment is merely confirmatory of what every-day experience with the substance teaches. *Potassium permanganate* has been more or less in favour with physicians for a score of years. It is well known as an oxidising agent, its powers in this respect are well marked. It is as little suitable for internal administration for such purpose as the body just considered, but for an opposite reason. Its chemical properties are developed by almost every substance, and in the doses in which it is given it will be decomposed and rendered inert very shortly after being swallowed. Within a very recent period the salt has come into notice as a remedy for amenorrhœa, and great has been the tribulation of apothecaries. It has been given in pill form, and all the usual excipients have been unavailable. I have made a few tests of the permanganate pills now in the market, and I find with regard to those made by one of the most reliable houses in this city that the permanganate is all decomposed and converted into the insoluble manganese dioxide. The preparations of two other manufacturers made up with some mineral excipient, probably kaolin, were in good condition, but as soon as placed in a mixture of hydrochloric acid and pepsine they begin to decompose into insoluble manganese oxide. These pills vary in strength from one-eighth to one grain. This small quantity of permanganate certainly must soon decompose in the stomach, and the only virtue which it can have is from the manganese itself, and if this is effective common sense would seem to suggest that the result could be best obtained by exhibiting some definite compound of manganese, such as the chloride or sulphate. When we consider the chemical relations of the salt, and almost certain inertness of it in small doses, the gravity with which the learned English therapeutists, who recommended it in amenorrhœa, have discussed the possibility of its producing abortion, becomes almost burlesque. I do not desire, of course, to impugn the clinical

observations that have been recorded on this point, but I feel obliged to say that if the insoluble and variable decomposition products of one-eighth of a grain of potassium permanganate can affect the function of any one organ, then the difference between us and the apostles of the infinitesimal is small indeed. I cannot dismiss these two compounds, which owe their popularity to mistaken notions of their properties, without saying a word or two as to the exhibition of oxidising agents. If rational therapeutics or physiological study indicates remedies of the so-called oxidising class, then it will be found that no better agents are known to us than those which have long been in our hands. In nitric acid, nitro-muriatic acid, and chlorinated soda we have substances which are sufficiently stable to resist the organic bodies of the saliva and gastric juice, and are sufficiently active to give oxidising effects if such (other than local action) can be obtained. I have grave doubts whether the nutritious fluids of the body can be oxidised by any method, but there can be no doubt whatever that such effect cannot be attained by either a body —potassium chlorate—which yields its oxygen only at a red heat, nor by one—permanganate—that decomposes the moment it touches any form of organic matter. Some years since a correspondent in one of our medical journals gravely recommended the use of raspberry syrup to disguise the taste of potassium permanganate. It was of course entirely successful, the taste was destroyed, so was the compound. *Caffeine citrate* is a remedy much in favour, and is a remarkable instance of how much physicians take for granted in the remedies they use. There is no caffeine citrate in the market, and it is doubtful whether any such a salt can be prepared. The commercial preparations are either pure caffeine or variable mixtures of it with citric acid. The manufacturers in this city each furnish a different article, except in cases in which they buy from a common source; and a house in a neighbouring city furnishes an article which contains no citric acid. Some of the samples are purely bitter in taste, while others are distinctly sour. Analyses of some of the commercial salts are recorded in a paper read before the last meeting of the American Pharmaceutical Association by Dr. G. C. Wheeler. He found the quantities of caffeine varied from 96·5 per cent. to 63·5 per cent.; of citric acid from 63·5 per cent. to 3·5 per cent.; none of these figures correspond with the proportion of a true citrate. It seems to me that accurate clinical observation cannot be made with a preparation of so uncertain a character; for, as seen by these figures, the proportion of active ingredient may vary thirty-three per cent., and the lesson that these analyses teach us is, that when the effects of caffeine are wanted they are best obtained by the use of the pure alkaloid, and not by a pretended

and uncertain compound of it. (*Boston Med. and Surg. Journ.* May 1, 1884.)

Clinical Aspects of Cerebral Syphilis.—Under this title Professor Horatio Wood publishes in the *Philadelphia Medical Times*, for March 8th and 22nd, an elaborate review of the present state of our knowledge of this affection, in which its ætiological relations are ably set forth. A general conclusion which he arrives at is, "I may state that it must be considered as at present proved that syphilis may produce a disorder, whose symptoms and lesions do not differ from those of general paralysis; that true general paralysis is very frequent in the syphilitic; that the only perceptible difference is one of curability; that the curable sclerosis may change into, or be followed by, the incurable form of the disease. Whether, under these circumstances, it is philosophic to consider the so-called pseudo-general paralysis and general paralysis as essentially distinct affections, each physician can well judge for himself." (*Med. Times*, June 7, 1884.)

Paraldehyde as a Narcotic.—Dr. Carl von Noorden, of Giessen, in an article on this subject, states that paraldehyde was first recommended as a narcotic by Cervello, in consequence of experiments made on animals; he found that it produced in them a quiet sleep without any excitement and followed by no ill-effects, and that it had no disturbing influence on the heart or respiration. Most of the notices hitherto published on the effects of paraldehyde on men have been from various lunatic asylums, and all have been favourable. The paper by Dr. von Noorden gives the results of the use of paraldehyde as a narcotic in a general hospital on all classes of patients. The paraldehyde used was obtained from E. Schering, of Berlin, and Merck, of Darmstadt; the dose varied from three to six grains, usually given with equal quantities of Tinct. Aurantii Co. and Syrup; generally four and a half grains were sufficient, but when larger quantities were given no unpleasant results followed. The drug was usually given at 8 P.M., sleep followed, as a rule, in about thirty minutes (from fifteen to forty-five), and there were very rarely any complaints of nausea after taking it. The patients slept, as a rule, from five to six hours, the sleep was quiet and deep, and if from any noise, &c., the patients woke up, they soon slept again. Those patients who suffered merely from nervous sleeplessness generally slept quietly through the night, others, who required a narcotic on account of dyspnœa, cough, or pain, were generally wakened towards morning by their complaint, and prevented by it from again falling asleep. On waking they felt refreshed, and had no bad after-effects, but sometimes noticed a smell and taste of paraldehyde, which,

however, was only strong enough to be disagreeable in two cases. The drug was given about 120 times to thirty different patients, most of them only took it once, several often; but these latter alternately with morphia, opium, bromide of potassium, and cannabin, in order to compare the effects of these various narcotics. It was given in cases of emphysema, bronchitis, phthisis, myocarditis, valvular diseases of the heart, spinal and other nervous affections, later stages of pneumonia, jaundice, chronic articular rheumatism, and sleeplessness from rheumatic neuralgia, &c. In two cases it produced nausea and headache, probably from individual peculiarities. In cases of severe gastric disorder and laryngeal phthisis it cannot be given, owing to its local effects. Special attention was given to its influence on the organs of respiration and circulation, both in cases where these organs were diseased and where they were healthy. Respiration was not affected in any case. Patients with weak hearts bore the drug well, experienced but little diminution of arterial tension, and obtained refreshing sleep. To observe the influence of paraldehyde by day, four patients took it in doses of five grains, all had slept well the previous night and only transitory sleep was produced; in these also the respiration was not influenced, there was a slight diminution in the frequency of the pulse, and a slight diminution of arterial blood-pressure. In order to determine the arterial tension, this was estimated by a sphygmograph at short intervals, both before and after taking the drug. Three of the four were strong men with healthy hearts; in these there was a slight decrease of tension. The fourth suffered from mitral insufficiency and constriction, and for a long time had been near the stage of failing compensation; in him diminution of tension was almost absent, and the drug had less influence in this direction than in the three with healthy hearts. The decrease of tension reached its maximum from one to two and a half hours after taking the paraldehyde; half an hour after this had been reached, the tension was in all cases restored to its previous height, and a few hours later had quite regained it. These cases appear to show that paraldehyde may safely be given as a narcotic in cases of heart-disease where chloral would be dangerous. (*Centralblatt für klinische Medicin*, No. 12, 1884.)

Cortical Lesions of the Brain.—While anatomical study, demonstrating a connexion between various organs of the body and definite regions of the surface of the brain, may furnish grounds for *à priori* reasoning as to the function of those regions; and while physiological experiments upon animals may afford valuable suggestions as to the probable effect of limited brain-disease in man, an accurate determination of the question of

localisation can only be reached by a study of clinical cases. The appreciation of this fact has led Dr. M. Allen Starr to collect the cases on record in American journals, in which a limited area of disease of the cortex, whose position was determined by a careful autopsy, had given rise during life to definite symptoms. From the comparison and classification of these cases with the foreign cases collected by Charcot, Ferrier, Nothnagel, Exner, Wernicke, and others, certain general conclusions, which are of great practical importance, have been reached, and it is now possible to refer many symptoms occurring in the course of brain-diseases to a destruction of a definite area of the surface. For instance, in reviewing the cases of lesion of the *frontal region*, it is noticeable that decided mental disturbance occurred in one-half. This did not conform to any one type of insanity. It is rather to be described as a loss of self-control, and a consequent change of character. The other symptoms are chiefly negative. The absence of disturbances of motion and sensation and of the special senses warrants the statement, that the motor and sensory areas of the cortex do not lie in the frontal region, and that the diagnosis of lesions of the frontal convolutions must rest upon the presence of general symptoms of cerebral disease and of mental disturbance, and also upon the absence of motor and sensory disturbance. Lesions of the *temporo-sphenoidal lobes* may exist without giving rise to any local symptoms. Symptoms of disturbance of the special senses of hearing and smell, and loss of memory of perceptions acquired through these senses, may be caused by lesions of this region; odours being probably perceived in the inner sphenoidal convolutions, and sounds in the first temporal convolutions. The areas connected with motion, with general sensation, and with vision, do not lie in the temporal lobes. The importance of a careful examination of all the special senses in any case of suspected brain-disease is enforced by the probability that some of the sensory areas lie in this region; but that the symptoms produced by their destruction have been hitherto overlooked. The most prominent local symptom of lesion of the *occipital lobes* is a disturbance of vision —blindness. Absence of motor or sensory distubance is also noted. A study of the cases warrants the conclusion that the visual area lies in the occipital lobes, and that the areas governing speech, motion, general sensation, and non-visual sensory impressions lie elsewhere. (*American Journal of the Medical Sciences*, April 1884.)

Asclepias Incarnata.—Dr. J. Hosack Fraser, after three months' clinical trial of the American diuretic drug *Asclepias incarnata*, or white Indian hemp, thus summarises its physiological actions: (1.) *On the Circulatory System.*—It stimulates the

cardiac contractions, and increases the blood pressure. For two hours after the administration of forty minims of the liquid extract, there is an increase in the strength and volume of the pulse. It steadies the cardiac contractions, and assists in restoring the rhythm of the pulse when any irregularity exists. The stage of stimulation is sometimes followed by slight depression of the circulation, and in order to maintain its stimulating effects it should be repeated at intervals of three hours. (2.) *On the Urinary System.*—It is a speedy, potent, and reliable diuretic. I have found it to succeed admirably in cases where the best known diuretics have entirely and signally failed. It is invaluable in all forms of dropsy, but especially so in dropsy of cardiac and renal origin. I believe that it acts on the kidneys in precisely the same manner as digitalis. One great advantage which it possesses is that it does not cause any gastro-intestinal disturbance; on the contrary, it frequently acts as a stomachic. The root is the part which is used in medicine, and is said to possess all the medicinal properties of the plant. It may be administered either in the form of an infusion, or a fluid extract. The latter preparation should be given in ʒss to ʒi doses every three hours. Smaller doses are useless. (*Birmingham Med. Review,* April 1884.)

Hazeline in Menorrhagia.—According to Mr. Henry M. Chute, menorrhagia is a very frequent ailment of women in Cape Colony. He has found a valuable remedy for it, he says, in the extract of American witch hazel (*Hamamelis virginica*), or hazeline, in doses of half a teaspoonful, in sugared water, twice or three times a day. Mr. Chute states that it acts so quickly that it is not necessary to anticipate the flow, but when menstruation, after it has lasted the ordinary time, is not closing naturally, hazeline given as above will effectually restrain it, and after hæmorrhage has ceased there is no advantage in continuing it. While thus taken, some patients have mentioned that they have a pleasant sense of exhilaration, of being strung up, and have lost that wearying sense of languor felt at these times. Another good result hazeline produces is that, when there is dysmenorrhœa, it in a very quick and marked way relieves the pain. Mr. Chute mentions the case of a young lady who suffered severely—so much as to necessitate her keeping in bed, and who was once so bad as to require a hypodermic injection of morphia. Since she has taken hazeline, menstruation has been painless and not excessive as formerly. (*South African Medical Journal,* Feb. 15, 1884.)

Curability and Treatment of Locomotor Ataxy.—Among 300 cases which Eulenburg has been able to follow, he has found

only three cures. He believes, however, that the number might be increased were sufficient energy expended on the treatment. He holds that the curative action of silver is incontestable, but that it is often inert when given in the form of pill or powder. He recommends that it should be given subcutaneously, either as the albuminate or as the hyposulphite—

℞	Chloride of silver . . .	10 centigr.	
	Hyposulphite of sodium .	60 ,,	
	Distilled water	20 grammes.	M.

An injection is given daily in the dorsal region, of 10 centigrammes to 1 gramme. There is generally a temporary disappearance of the pains, and when they reappear after two or three hours they are generally removable by a cold compress. Hypodermic injections of strychnine in doses of 4 to 6 milligrammes have, in several cases, been followed by a remarkable diminution of the motor and sensory disorders. Local refrigeration by means of ice or cold compresses along the vertebral column has had beneficial results. The degree of cold must be determined by the individual sensibility of the patient. With the nitrate of silver, the continuous current, and local cooling, he has in numerous cases improved the patient's condition. (*La France Médicale*, Jan. 10, 1884; *Glasgow Med. Journ.*)

Antiseptic Cotton-wool Sponges and Sponge-Pads.—Mr. Gamgee has devised a new kind of sponges and sponge-pads for use as substitutes for natural sponges in surgical operations, or as pads for dressings. They are made of his absorbent gauze and wool, but are rendered elastic by the addition of a certain amount of *coir* fibre in their construction, and at the centre of each there is a glass capsule containing an antiseptic—carbolic acid, thymol, eucalyptol, iodoform, &c.—which is easily cracked by pressure with the fingers, and diffuses its contents throughout the material. Their utility for surgical work is obvious, and they are especially likely to prove valuable in private practice, in field surgery, in military surgery, &c. (*Birmingham Med. Review*, June 1884.)

ERRATA.

In Dr. Goodridge's paper in the *Practitioner* for July,
Page 6, line 6, *for* "polyarthritic," *read* "polyarthric."
,, 8, ,, 25, *for* "sweating," *read* "sweaty."

Bibliography.

Traité élementaire de Pathologie générale, comprenant la Pathogénie et la Physiologie pathologique. By Prof. H. Hallopeau. Sm. 8vo, pp. 723, with 126 Woodcuts. Paris: Baillière. 1884.

Recent Materia Medica; notes on their origin and therapeutics. By F. Harwood Zescher, F.C.S., etc. 8vo, pp. 65. London: Churchill. 1884.

A Treatise on the Continued Fevers of Great Britain. By Charles Murchison, M.D., LL.D., F.R.S., etc. Third Edition, edited by W. Cayley, M.D., F.R.C.P., etc. 8vo, pp. 731, with plates and charts. London: Churchill. 1884.

Wharton and Stillé's Medical Jurisprudence. Fourth Edition, edited by Robert Amory, A.B., M.D., etc., and Edward S. Wood, A.M., M.D., Professor of Chemistry, Harvard Medical School. Vol. II. (Poisons). 8vo, pp. 669. Philadelphia: Kay and Brother. 1884.

On Visceral Neuroses, being the Gulstonian Lectures on Neuralgia of the Stomach and Allied Disorders. By T. Clifford Allbutt, M.A., M.D., Cantab., F.R.S., etc. 8vo, pp. 103. 4*s.* 6*d.* London: Churchill. 1884.

Clinical Demonstrations of Ophthalmic Subjects. By J. R. Wolfe, M.D., F.R.C.S.E., etc. 8vo, pp. 54, with Illustrations. London: Churchill. 1884.

Syphilis and Pseudo-syphilis. By Alfred Cooper, F.R.C.S., etc. 8vo, pp. 339. 10*s.* 6*d.* London: Churchill. 1884.

Sleep-walking and Hypnotism. By D. Hack Tuke, M.D., LL.D., etc. 8vo, pp. 120. 5*s.* London: Churchill. 1884.

Diseases of the Heart and Thoracic Aorta. By Byrom Bramwell, M.D., F.R.C.S.E., etc., etc. 8vo, pp. 783, with 317 Illustrations. 25*s.* Edinburgh: Young J. Pentland. 1884.

*** Any of the foreign works may be procured on application to Messrs. Dulau, of Soho Square, W.C.; Williams and Norgate, of Henrietta Street, Covent Garden W.C.; or Baillière, of King William Street, Charing Cross.

Department of Public Health.

THE SPREAD OF INFECTION THROUGH THE AGENCY OF SCHOOLS.

THE last Code issued by the Education Department of the Privy Council in March, 1882, confers upon sanitary authorities the power to require either the closure of elementary schools, or the exclusion from them of children from certain districts or houses for a limited period, for the purpose of preventing the spread of infectious diseases by reason of school attendance. Sanitary authorities will necessarily have to be guided in any decision they may arrive at in this matter by their medical officer of health, and Dr. Buchanan, in his annual report to the Local Government Board for a previous year, has already pointed out that it will in each case be necessary to decide whether the object of preventing the spread of infection can best be gained by the entire closure of the school, or by the less stringent measure of excluding from school such pupils as come from infected houses or districts. In his recently issued Report for 1882 he returns to this subject in order that he may place at the disposal of officers of health the information which has already been acquired by the Medical Department of the Local Government Board as to the conditions under which it is desirable, in the interests of health, to take action in one or other of the senses indicated, and for this purpose he has, with the assistance of Dr. Franklin Parsons, prepared a memorandum on the subject. The memorandum is compiled from information which has been submitted to the Board both by their own medical inspectors and by medical officers of health in annual and special reports, and it is sought so to use this information as to indicate the best means of preventing the spread of infection by school

children among their fellows, whilst avoiding unnecessary interruption of the work of education.

The principal article of the Code is Article 98, which runs as follows :—

"The managers must comply with any notice of the sanitary authority of the district in which the school is situated requiring them for a specified time, with a view to preventing the spread of disease, either to close the school or to exclude any scholars from attendance, subject to an appeal to the Department if the managers consider the notice to be unreasonable." It is pointed out in the Memorandum that—

"The diseases for the prevention of which school closure, or the exclusion of particular children, will be required are principally those which spread by infection directly from person to person, such as scarlet fever, measles, diphtheria, whooping cough, small-pox, and rötheln, the order in which the several diseases are given being about that of the relative frequency with which their occurrence gives rise to these questions at schools. More rarely, the same questions arise in connexion with enteric fever and diarrhœal diseases, which spread not so much by direct infection from person to person as indirectly through the agency of local unsanitary conditions, such as infected school privies."

1. *As regards exclusion from school.*—It is laid down as a principle that all children suffering from a disease which is likely to be dangerous to any persons attacked by it, should, however mild the disease, be excluded from school until there is reason to believe that they are no longer capable of communicating infection. And since it is rarely possible to provide effectual isolation for those who are sick, it becomes almost always necessary to exclude from attendance all children living in an infected house; for quite apart from the fact that they may convey infection by means of their clothing or otherwise, they may themselves be suffering from the disease in question in an, as yet, unrecognised form. Some infectious diseases, such as mumps and various skin affections, whilst highly infectious, can hardly be regarded as dangerous, but it will in the long run be advantageous in the interests of education to exclude scholars so suffering, lest by the rapid diffusion of infection it may ultimately

be found that the regular attendance has become seriously diminished.

With a view of securing, to the utmost, efficiency in checking the spread of infection, it is important that the school-masters and mistresses and the school-attendance officers should be in frequent communication with the medical officer of health. The latter officer should have the earliest possible information as to the existence of any cases of infectious disease, and since the first intimation may be in the hands of some of the school officials, they should be instructed at once to convey the news to the officer of health, who will then judge how he should act. On the other hand, the latter officer should, without necessarily waiting to communicate with his sanitary authority, advise the teacher of the school or schools which the children of infected households may be attending, requesting them to exclude certain children from school.

The regular notification by the school-masters of all absentees to the officers of the sanitary authority has in practice been found to be of the utmost value. In some districts Forms, with counterfoils, have been prepared for this purpose, and where they have been regularly used it has for some years past not been found necessary to close a school; whereas the refusal of school authorities to supply this information has in other cases resulted in the frequent closing of schools on account of the rapid diffusion of fatal infectious disease. School-masters may also render material aid to health and education by noting carefully, during periods when such diseases as scarlatina or diphtheria are prevalent, the earliest indications amongst the scholars of any sore throat or febrile symptoms.

As regards the period for which exclusion from school attendance should be specified, no hard-and-fast rule can be laid down. But it will be policy, in the first instance, not to specify too long a period, but rather to renew the prohibition as the result of fresh enquiry, when the first period is about to expire.

2. *As regards the closing of schools.*—This step, according to the memorandum, should, under ordinary circumstances, only be enforced in the presence of an actual epidemic, and not even then unless there be a clear prospect that an end will be achieved

which cannot be attained by the less comprehensive action of exclusion from school. In deciding which course should be adopted the two most important points to consider are :—

" (*a*) The completeness and promptness of the information received by the officers of the sanitary authority respecting the occurrence of infectious cases.

" (*b*) The opportunities which exist for intercourse between the children of different households elsewhere than at the school."

If the cases to be dealt with are few in number and the centres of infection are all known, exclusion will in most instances suffice, but if there are unrecognised centres through which fresh attacks at school are constantly arising, or if the attendance at a school has already become largely reduced through numerous exclusions, then closing of the school will be the best course to adopt. Measles is a disease which is very apt to defeat any such action as mere exclusion, because it is infectious at so early a stage as not to be recognisable ; and more than one medical officer of health has found that the most effectual way of dealing with it has been to close a school altogether for a fortnight, and then to carefully exclude from attendance all children from households already attacked, as also all pupils who may subsequently develope symptoms of the disease.

Another point to be taken into consideration in deciding whether to close a school or merely to exclude certain scholars, relates to the facilities which children have for meeting together when away from school. If infection prevails and the children all live near together, it is quite possible that closure of the school may, by giving them ample opportunity for collecting together at play, bring them more into contact with fellow pupils from infected houses than any other course. But on the other hand, if the scholars come from scattered hamlets and isolated localities, and rarely meet except at school, then school-closing will probably afford the best means of staying any further spread of disease.

Schools may also have to be closed for a few days whilst sanitary defects, which have been discovered, are being remedied. Enteric fever or diarrhœa may lead to the discovery of faulty drains, leaky cesspools, offensive privies, &c., and it will then be

L 2

of the utmost importance that the children should not be collected together during the performance of work which will probably cause temporary nuisance and foul emanations.

Sunday schools and private schools, it must be remembered, are not subject to the provisions of the Code of the Education Department, and unless action can be taken against them for overcrowding, or under Section 126 of the Public Health Act 1875, medical officers of health will have to rely on their personal influence with those in charge of these schools, to secure either the exclusion of such scholars as would constitute a source of danger to others, or the entire closing of the schools for such period as may be necessary.

In conclusion, two general observations are made in the Memorandum.

"First, that in proportion as the sanitary authority have performed their own proper work for the protection of their district from infectious diseases—as they have secured early information of the occurrence of cases; as they have provided accommodation for the isolation of such cases; and arranged for keeping patients under supervision until their infectious condition has ceased; and as they have provided for the subsequent disinfection of infected houses and things—the more successfully will they be able to deal with such diseases when they occur without the serious interference with the business of popular education involved in the compulsory closing of schools.

"Secondly, that the proper work of schools is facilitated and the credit of the school is promoted by every measure which hinders the spread of infection. Wherefore it is entirely in the interests of school managers themselves to trust the skilled judgment of sanitary authorities, and to aid their endeavours to maintain the public health."

AN ENQUIRY INTO INDIAN MORTALITY WITH A VIEW TO ITS PALLIATION.

BY T. HUME, M.B.
Civil Surgeon, Amraoti.

THE excessively high death-rate of India among certain classes of the community, and at certain seasons, is one which elicits spasmodic outbursts of sympathy and futile efforts at mitigation, ending in apathy, or dismissal of the subject as being one too difficult to be grappled with, which we have the authority of a recent philosopher for saying, is an apology for doing nothing. The primary bases necessary for coming to some practical issue are not recognised; and all measures yet put in force, with one exception to be subsequently noticed, can only be characterised as random hopes that the suggestions made may contribute to a happier state of things. The population of the jails in India is an example where we have a community so suffering, and of the inadequacy of measures and remedies applied. The dreadful mortality that took place in them in 1878 was striking enough to rouse the English people from their usual phlegmatic attitude towards Indian affairs. The outcry was so loud that it should have produced some other result than the mortality list and death-rate that will have to be chronicled for the year 1883.

Here is a community which suffered from a death-rate of 81·31 per mille in 1878, which has step by step had its mortality lowered, to 73·73 in 1879; to 48·31 in 1880; to 44·03 in 1881; and to 39·96 in 1882:—*i.e.* five years to reduce the fearful mortality of 1878 one half, a result which should have been attained in one year had intelligent measures been adopted. That this is no rash statement, it is necessary only to compare the following figures of the death-rate in the jails of the Hydrabad assigned districts, with those given above.

In 1878 the death-rate was 74 per mille; in 1879 it was 28 per mille; in 1880, 39 per mille; in 1881, 13·8 per mille;

in 1882, 6 per mille; and in 1883, somewhere about 5 per mille. In the beginning of 1881 the diet scale devised by me was adopted with the above beneficial results. That starvation was at the bottom of the above high death-rate is palpable, for immediately the improved diet scale was given the death-rate fell.

To deal with the mortality of India a knowledge of the people and their circumstances is necessary, and it is on this point that Indian sanitary officers are so lamentably deficient. Their acquaintance with Eastern languages is usually limited, and their attempts to engraft European sanitation on Indian villages a failure.

The people of India are for the most part agricultural, and very poor; the majority of them live a hand-to-mouth existence, but owing to their peculiar custom of caste they escape pauperism. So long as a member of a family can get food he will share it with the people counting kin with him to a wonderfully extended connexion. Thus, where one man in a European country would be in work and plenty, half a dozen others would be starving, or be on the poor board, here in India these seven members of the community would share equally. In such a poor, over-populated country every one cannot obtain employment, and the one individual who does supports others to the full extent of his means. This system of levelling, as it were, the prosperity, prevents any attempt at laying aside for emergencies; and when any rise in the price of grain occurs, it affects the largest number of the population at once. Immediately homes and families are broken up, and an exodus takes place from the famine-stricken part; but if this scarcity extends over a large tract, starvation and death overtake the emigrants before they can pass the border-land of famine. Those left behind undergo a slower starvation, but succumb to a not less certain death.

Mortality from famine nowadays quickly attracts the attention of Government, and every means that money can command or ingenuity devise is put in force for the amelioration of the sufferings of its victims. It is not to these volcanoes of death in action that attention requires to be directed, but to that seething cauldron represented by a high rate of mortality ready

at any moment to become one of these appalling eruptions. Whenever there is in any country excessive mortality, there is always more distress, more want, and more illness in that part than there is in another with a lower death-rate. Therefore the statistics of mortality occupy a position analogous to barometric observations; by them the condition of the people is gauged, any rise in them must be quickly recognised, and it is on the rapid apprehension of what they represent, *i.e.* of this starvation short of famine, that most human life will be saved and the horrors of famine averted. The telegraph is extensively used in India for meteorological purposes with most doubtful beneficial results; if, instead of this useless expense, the Government of India had telegraphic summaries of the death-rates supplied to them, greater practical benefits would accrue than will from the next half century's barometric readings or records of thermometric changes. The reports of occurrence of high death-rates take such a time travelling through the various offices of the Government that famine and distress are often the first news that arrive at headquarters. This would not have been the case had short telegraphic summaries been transmitted.

At present there are many indications of famines being more frequent than they have been formerly, and on this account this suggestion must be considered well-timed. Without going into all the causes which will increase scarcity in the land, I will mention one as an example—the reckless railway extension which permits the export of large quantities of grain, and consequent increase in the prices of it at places where it is produced, and obliteration of the plans of storing in use. Owing to the peculiar conditions of India, viz., that the soil cannot produce more than will support the population, this result, which would represent prosperity in any other country, means ruin here. The economic rule that the increased value of an article must benefit the producer, is abrogated in India, for the producer being always in debt—practically a serf—all the grain is intercepted by a middleman—the money-lender. Government are well aware of this, and have by means of agricultural experiments and shows tried to remedy the short production; and by instituting Agricultural Banks, State notes, and other

measures, have tried to do away with the money-lender—this Old Man of the Sea who sits on the shoulders of the Indian community. It has not yet by any means met with success in its endeavours, and it seems reasonable to expect that Government will turn more of its energies towards releasing the population from the thraldom of debt, than to providing roads and railways which drain the country for the benefit of the predacious money-lender. From a sanitary point of view, it is much more important that this middleman be broken down and done away with, than that means of exportation should be increased. Surely, with Shylock, the people of India can say—

> "You take my life
> When you do take the means whereby I live."

This railway speed suits not the country, and must bring on a period of calamity which Government will not have the power to meet. This period is well-nigh upon us in some parts of India.

This recapitulation of well-recognised facts is necessary to present the condition of the population to those who are not informed in Indian affairs, though they may be interested in those of humanity. Instead, therefore, of dealing with cycles which culminate in famines, and convert the country into a necropolis, this paper will deal merely with the record of mortality as it can be studied in the short space of a year. In this short life-history we find the circumstances of the life-history of a people in miniature. As there are regular periods of unhealthiness which recur with almost unvarying certainty at particular seasons of the year, there must be an equally unvarying cause. This has been put down to the regular return of the rains, among other hypotheses, but they are all at fault and merely partial explanations, the true one is that the people are starving. The cause of the mortality is starvation. My reason for making this sweeping statement is, that the jail community of Berar, who have been properly fed, though by no means luxuriously so, have only a death-rate of five per mille, while the outside population are dying at the rate of fifty-four per mille. When the great mortality among the jail population came upon India in 1878 and 1879, owing to the late introduction of the Conference diet scale into the

Berar jails, it did not affect their inmates until the year 1880. Having to inquire into this matter I came to the unavoidable conclusion that the whole sickness and mortality was due to starvation. The hard-labour diet consisted of—

Proteids	3	ounces.
Fats	1	,,
Amyloids	20	,,
Salt	1	,,

which should have been according to Moleschott—

Proteids	$4\frac{1}{2}$	ounces.
Fats	3	,,
Amyloids	$14\frac{1}{4}$	,,
Salt	1	,,

And according to McKendrick—

Proteids	6	ounces.
Fats	4	,,
Amyloids	17	,,
Salt	$1\frac{1}{2}$	,,

To this Conference diet-scale I added two ounces of pulse and half an ounce of fat, which had the immediate effect of reducing the mortality from 42·1 in 1880 to 8·5 in 1881 in the Amraoti jail, after its introduction. During 1882 the death-rate was 8·4 per mille, and in 1883 only 5 per mille, while the outside population were dying at nearly eleven times that rate—at fifty-four per mille. The Bengal jail dietary was improved by adding *goor* or sugar, a perfectly unnecessary addition seeing the amount of amyloids already in the diet, and with what result? The Sanitary Commissioner with the Government of India considers the reduction of the jail mortality from eighty-one per mille in 1878 to forty in 1882 as "satisfactory." But what about his numbers of 1883? To have a mortality eight times higher than the possible mortality is hardly satisfactory.

To return to the life-history, it appears that this regular increase of sickness at certain seasons would be indicated in a community such as a jail one, which has no means of

augmenting its food supplies, by a loss of weight; and that by a careful study of this, something might be done towards increasing the dietary at certain seasons of the year, thereby keeping up a uniform condition of body, and consequently, of health. The results have to be judged by the opportunities, and not by the actual number of figures that can be produced.

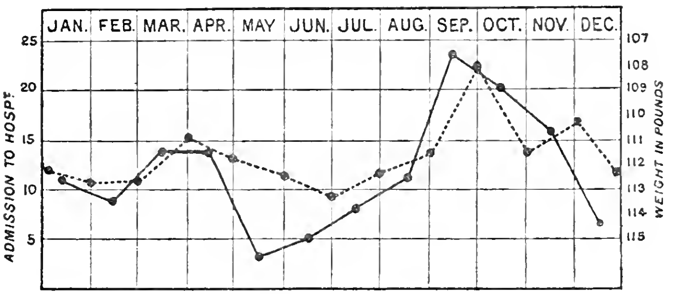
The people who were weighed monthly for the year 1882 were 250 in number, and from the weighings they may be considered to have had an average weight of 111·6 pounds each. Beginning in January, their average weight was 112·5 pounds; they gained a quarter of a pound in February, lost the same amount in March; lost one pound and a half in April, in May they gained half a pound, in June one pound, in July they gained nearly three quarters of a pound, which brings them to their maximum weight in the year, viz., $113\frac{1}{8}$ pounds; in August they lost nearly three quarters of a pound, in September they fell one pound, in October they lost three pounds and a quarter on the previous month's weight, the average weight for the month being only $108\frac{1}{4}$ pounds; they increased almost the same amount in the following month, but lost one pound in December, bringing their weight in that month to $110\frac{1}{4}$ pounds.

These weights are taken in a healthy community who averaged 478 daily in number, and had a death-rate of 8·4 per mille. The 251 whose weights are recorded above were taken out of this number, not by selection, but simply because they had a full twelvemonth's record of weight in the jail. Some of the others were not received until after the 1st of January, others were released before the 31st of December.

It is unnecessary to say that the four men who died during the year are not included in the above list. As far as is known, here is the physiological fluctuation of the weight of the human body in India for 1882. As four men died during the year it may be as well to mention that their deaths were unconnected with present jail conditions. One died from sudden perforation of the stomach four days after his receipt into jail, the second died of phthisis, the third from remittent fever, and the fourth had had scurvy in 1880, and died of dysentery.

Now having got the physiological fluctuations, we will see what bearing they have on the pathological data. Taking first the amount of sickness in the jail community itself, we find the monthly admissions to hospital during the year to be as follows:—11, 9, 14, 14, 3, 5, 8, 11, 23, 20, 16, 7, for each month.

Taking a graphic mode of illustration, the curves formed by the admissions to hospital will be compared with the variations in weight. As they go inversely, the right-hand figures, the weights, increase from above downwards, and the admissions from below upwards.



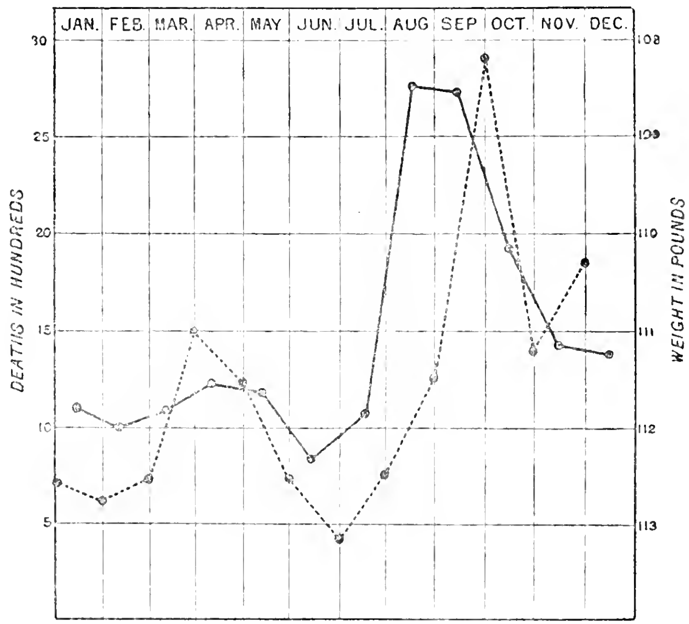
The dotted line represents the fluctuation in weight, and the black line the admission to hospital.

In the above table the comparison is made between the weight and the health of the same community, in which a certain correspondence would have been expected, but in the following one, the death-rate of the Amraoti district, with a population of 575,328 souls, is treated in a similar manner. In 1882 this community had a death-rate of 31 per mille. The monthly records of deaths from all causes vary from 851 in June, to 2,744 in August.

Such a coincidence as this in the curve of death of 17,903 persons, with that of the physiological loss in weight of a number of healthy men, who suffered from no serious illness at all, points to the conclusion that had these people been better fed they would have been able to resist "the tendency to death" so strongly marked in the curve opposite the months of August, September, and October (see diagram on p. 156). That the weight curve follows the death curve, *i.e.* is always behind

it, is accounted for by the fact that the prisoners were a healthier community (their death-rate being only 8·4), and were better fed than the general outside population.

In the central portion of India where the Amraoti district is situated, there is yearly a large mortality from "fevers," and many hypotheses are extant as to their causation. By some they are considered entirely malarial fevers, and are put down as



the effect of this mysterious agent. It may be held to be mysterious, as some medical officers have denied its specific existence altogether, while others see its agency in every slight *malaise*. Much of the fever is neither intermittent nor remittent, typhus fever is the type in which a great portion of it belongs; it is most correctly described as "starvation fever."

These fevers are assisted in their appearance by the following causes working conjointly :—

(1.) Physiological demands for increased nourishment by the body, at certain seasons.

(2.) By the starvation consequent on the inability of the

general community to meet this extra demand in their food supply.

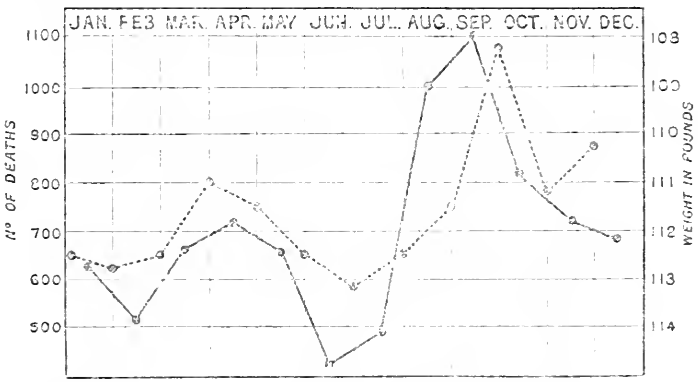
(3.) The rain causing the people to inhabit their close unventilated houses, instead of sleeping in the open air as they do in the hot weather.

(4.) Malarial emanations caused by moisture.

(5.) Heat and consequent exhaustion, which shows its agency in the two hottest months of the year, April and May, by a rise in the death-rate.

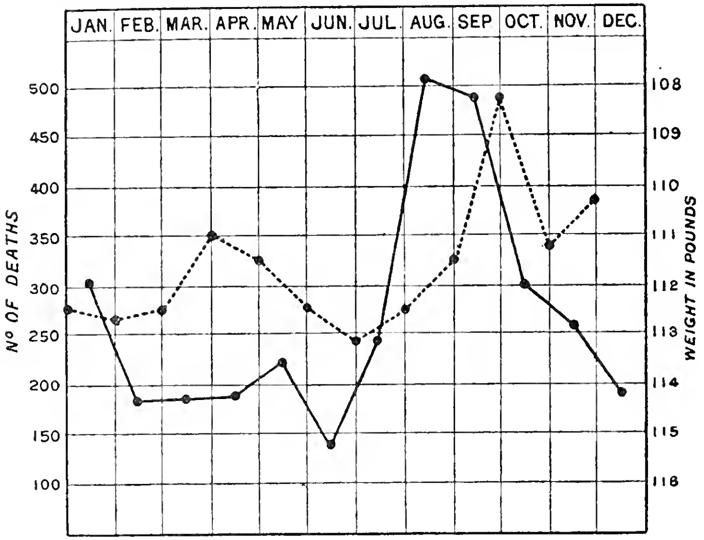
These fevers must not be confounded with real typhus fever, because they have not the regular course of that fever, nor have they apparently the infectious properties of that fever, nor do they appear as an epidemic, in the sense of an infective epidemic, but only at certain seasons of the year, when certain physiological and local conditions favour their development. As we have no means of distinguishing in the returns this "starvation" fever from the pure malarious fevers, we must be content to consider them together.

The following diagram shows the correspondence of the curves of fever mortality, with those of the physiological fluctuations of weight during the year 1882 :—



It has long been recognised that bowel complaints have their causation in bad feeding and unsuitable food. This is evidenced by Government returns, where deaths from dysentery and diarrhœa are singled out and shown separately in the general returns of diseases and death. Taking in monthly detail the 3,214 deaths which occurred in the Amraoti district in 1882 from

this cause, and comparing them with fluctuations in weight, the following coincidence of causes is apparent:

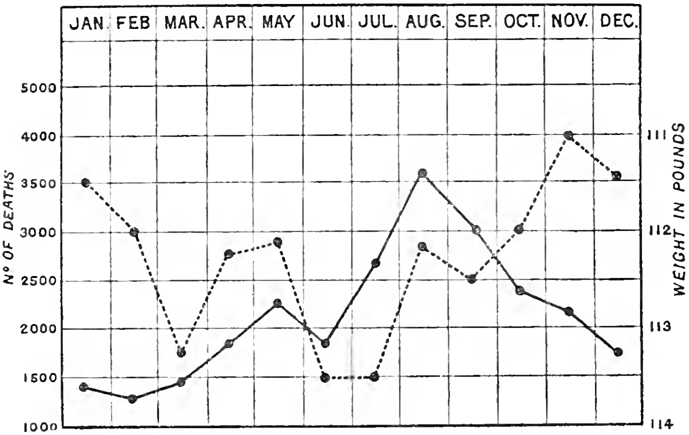


The dotted line indicates the weight curve; the black one the number of deaths.

This ends the comparison with the curves of the various mortalities for the year 1882. The only caution necessary in looking at these tables is not to consider the later appearance of change in the weight curve an element of disagreement, it is merely an evidence of better feeding.

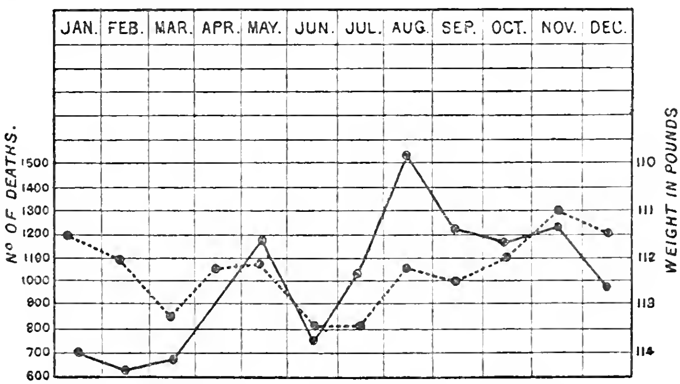
Proceeding with the 1883 results, the tables in this case sufficiently exemplify the coincidence of the weight curves with the general health. In 1883 the full consecutive weights of 204 convicts are taken, that is, nearly fifty less than in the previous year. An explanation is necessary in contemplating these tables. The fever table contains records of 11,951 deaths; in the months of September, October, November, and December a marked disturbance in the coincidence of the curves takes place. There is no doubt that this is due to the presence of the cholera epidemic, which, in the months of July and August alone, killed off nearly 6,000 people. This amounts to a mortality of eleven per mille on the population of the district; and such a withdrawal of persons likely to die from the general population must

necessarily disturb the ordinary curves of mortality for some time after.



The dotted line shows the fluctuations in weight, and the black line represents the number of deaths from all causes. From the deaths from all causes 2,370 have been eliminated in July and 3,425 in August. These were due to an epidemic of cholera. They exaggerate the curve, but quite coincide with the weight fluctuations of these months. The death curve represents the mortality of 31,309 people, with the above-mentioned deduction, or a death-rate on the population of the district of fifty-four per mille.

The deaths from fever were 11,951, and their curve corresponds very closely with the weight curve.



The dotted line represents the weight curve and the black one the mortality from fever.

The conclusion that the mortality is due to starvation from the above details is borne out by the following comparison of the prices of food grains and the mortality of the various years :—

	Death-rate.	Grain-rate per Rupee.
1877	24·9	16·8
1878	78·5	17·14
1879	22·5	14·6
1880	20·3	20·1
1881	25·6	39·4
1882	31·5	30·4
1883	54·4	28 6

The dearness of grain in 1877 did not affect the population, because they had some stores to fall back upon, but when the rate continued high in 1878 then the mortality rose.

The mortality in 1879 was low owing to the want of people to die. The gradual rise of mortality from 1881 to 1883, with the increasing dearness of grain, needs no comment; it, however, shows that the population is less able than it was to stand against even a moderate rise in prices.

If, instead of inundating the country with officers for the Public Works Department, to make roads and railways, Government were to turn the energies of these men to improving the agricultural methods, to devising means for increasing the production of the land, it would be doing the greatest good to the millions of India.

THE PRACTITIONER.

SEPTEMBER, 1884.

Original Communications.

MICRO-ORGANISMS AND DISEASE.

BY E. KLEIN, M.D., F.R.S.

Joint-Lecturer on General Anatomy and Physiology in the Medical School of St. Bartholomew's Hospital, London.

(*Continued from* p. 112.)

CHAPTER XVII. *continued.*

(*B.*) The second instance in which the transformation of a common septic into a specific or pathogenic organism has been experimentally achieved, or I should rather say has been stated to have been achieved, is the jequirity bacillus. In 1882 the well-known ophthalmologist M. L. de Wecker in Paris drew attention to the therapeutic value of the seeds or beans of *Abrus precatorius*, a leguminous plant common in India and South America. The people of Brazil use it under the name jequirity as a means to cure trachoma or granular lids. De Wecker after many experiments found that a few drops of an infusion made of these seeds causes severe conjunctivitis, in the course of which, no doubt, trachoma is brought to disappearance and cure, and it is accordingly on the continent and in this country now used for this therapeutic object. [I am informed by my friend

Dr. T. Lewis, formerly of India, now pathologist at the Netley Army Medical School, that the people in some parts of India know the poisonous property of these seeds, and utilize it by inoculating cattle with them subcutaneously; in consequence a severe inflammation is set up, and the animals die of some sort of septicæmia. This is done for the sake of simply obtaining the hides of the beasts.]

Sattler, in a very important and extensive research (*Wiener medic. Wochenschrift*, N. 17–21, 1883, and *Klin. Monatsbl. f. Augenheilk*, June 1883), ascertained that when an infusion of the jequirity seeds is made of the strength of about half per cent., this infusion after some hours to a few days contains numerous bacilli, motile, capable of forming spores, and in all respects identical with a bacillus subtilis. The bacilli are about 0·00058 mm. thick, and from 0·002 to 0·0045 mm. long. They form a pellicle on the surface of the infusion, and in the bacilli of this pellicle active spore formation is going on. The bacilli grow and multiply well at a temperature of about 35° C., but also, only slower, at ordinary temperature. Sattler cultivated artificially the bacilli on blood-serum gelatine and meat-extract peptone gelatine, both solid media, and continued their growth through several successive cultivations. Both the infusions of the jequirity and the bacilli taken from these artificial cultures inoculated into the conjunctiva of healthy rabbits produce severe ophthalmia, leading to the production of great œdematous swelling of the conjunctiva and eyelids, and temporary closure of the latter, and to the secretion of purulent exudation. Both the exudation and the swollen lids are said to contain infective bacilli and their spores. Sattler ascertained by many experiments, that none of the bacilli and the spores distributed in the atmosphere had those specific properties, viz., to excite ophthalmia, as long as they grow in other than jequirity fluid, but having had access, *i.e.* having entered the jequirity infusion, assume here this specific power. There is no doubt that Sattler worked the whole problem with great care, worked out all points connected with it in great detail, and for this reason his work was considered to have for the first time unmistakeably established that a harmless bacillus, owing to the particular soil in which it grew, assumes definite specific or pathogenic

properties. To me this jequirity bacillus had a great interest, since I was particularly anxious to get hold of such an organism, in order to see whether and how far it can again be made harmless. For if ever there was a good case, a case in which a previously harmless micro-organism had by some peculiar conditions become specific, this was a case; and therefore it must be here possible by altering its conditions of life again to transform it into a harmless being. The theoretical and practical importance of such a case must be evident to every one who has at all devoted any thought to the relation of micro-organisms to disease. The whole doctrine of the infectious diseases, I might almost say, is involved in such a case, for if in one case it can be unmistakeably proved that a harmless bacterium can be transformed into a pathogenic organism—*i.e.* into a specific virus of an infectious malady—and if this again can under altered conditions resume its harmless property, then we should at once be relieved of searching for the initial cause in the outbreak of an epidemic. But in that case we should be forced to contemplate, as floating in the air, in the water, in the soil, everywhere, millions of bacteria which, owing to some peculiar unknown condition, are capable at once of starting any kind of infectious disorder, say anthrax (Buchner), infectious ophthalmia (Sattler), and probably a host of other infectious diseases, and thus to form the starting-point of epidemics. And the only redeeming feature, if redeeming it can be called, in this calamity would be the thought that the particular bacterium would by and by, owing to some accidental new conditions, again become harmless.

These were the reasons, and good reasons I think they were, which prompted me to inquire into the jequirity bacillus and jequirity ophthalmia, and after a very careful and extensive series of experiments, to be described presently, I have proved beyond any doubt that the jequirity bacillus, *per se*, has no more power to create an infectious ophthalmia than Buchner's hay-bacillus had of creating anthrax.

The following experiments prove this conclusively:—

The seeds of jequirity (*Abrus precatorius*) are crushed and powdered, the perisperm is removed, and of the rest an infusion is made of about the strength of half per cent. with distilled water, previously boiled, and contained in a flask previously

sterilised (by heat) and plugged with sterile cotton-wool. The infusion is made while the water is still tepid. After half an hour the infusion is filtered into a fresh sterile flask, plugged with sterile cotton-wool, the access of air being limited as much as possible. This is effected by keeping the cotton-wool in the mouth of the flask around the end of the glass filter. The filtered fluid is of a slightly yellowish-green colour, and is almost neutral and limpid. A small quantity is withdrawn with a capillary glass pipette freshly drawn out, and from this several test-tubes containing sterile nourishing material (peptone solution, broth, Agar-Agar and peptone) are inoculated; and from the same pipette, and at the same time, several eyeballs of healthy rabbits are inoculated, by placing a drop or two of the infusion under the conjunctiva bulbi. The test-tubes are placed in the incubator and kept there at 35° C. After twenty-four hours all eyeballs are intensely inflamed, the eyelids closed and swollen, and a large amount of purulent secretion is present in the conjunctival sac, but all the test-tubes remain perfectly limpid; no growth has made its appearance, and they remain so.

In a second series the infusion prepared in the above manner is used fifteen minutes after it is made and used as above, for inoculation of test-tubes and eyeballs. The fluid in the test-tubes after incubation remains limpid, the eyeballs all become inflamed. In both series the amount of fluid inoculated into the test-tubes is more than twice as great as that injected into the eyeballs. From this it is quite clear that the fluid used for inoculation of the test-tubes was barren of any micro-organisms and nevertheless it possessed a powerful poisonous principle. I do not mean to say that the infusion as a whole contained in the flask contains no organisms, but that the small quantity of the fresh infusion that was used for the inoculation of the test-tubes and eyeballs contained none is absolutely certain. When such a flask is placed in the incubator, after twenty-four to forty-eight hours or later, there are found in it large quantities of bacilli, the spores of which must have entered from the air during the process of preparing the infusion. The bacilli are such as described by Sattler; they soon form spores in the usual way. Such an infusion is very poisonous, just like the fresh one. Sattler has shown, and this is easily confirmed, that the spores of these

bacilli stand boiling for a few minutes without losing their power to germinate. Consequently, if such a poisonous infusion full of bacilli and spores be boiled for half a minute the spores are not killed. The proof of this is—that if with a minute dose of this spore-containing boiled infusion any suitable sterile nourishing material in test-tubes be inoculated, and then these test-tubes be placed in the incubator at 35° C., after twenty-four to forty-eight hours the nourishing fluids are found teeming with the jequirity bacilli; *but no amount of this material produces the least symptom of ophthalmia. Every infusion of jequirity loses its poisonous activity by boiling it a short time,* ½ to 1 minute, and hence the above result.

In this respect the poisonous principle of jequirity infusion comports itself similarly to the pepsin ferment, which, as is well known, is destroyed by short boiling.

If an infusion is made as above, and after fifteen minutes it is filtered and then subjected to boiling for ½ to 1 minute, it will be found to have become absolutely non-poisonous, but not sterile. On placing it in the incubator after twenty-four to twenty-eight hours, vast numbers of the jequirity bacillus are found in it. But no amount of this fluid is capable of producing the slightest symptom of ophthalmia.

A large percentage of the rabbits, whose conjunctiva has been inoculated with the fresh unboiled poisonous infusion, die after several, three to eight, days. The eyeballs and eyelids are intensely inflamed, as stated above, the skin and subcutaneous tissue of the face, neck, chest, and even abdomen, is found enormously œdematous, the pericardium, pleura, lungs, and peritoneum very much inflamed, their cavities filled with a large quantity of exudation. The exudations of the conjunctiva, pericardium, peritoneum, the œdematous skin and subcutaneous tissues contain no infectious property, and as a rule no bacilli or spores of any kind, if examined in the living animal or immediately after death.

There is one point which requires careful consideration, it is this: Sattler states that he has cultivated the bacillus, taken from a poisonous jequirity infusion, through several successive generations on solid material, and with the new cultures he was able to produce the jequirity ophthalmia. I have no doubt

whatever that this is really the case, but it bears an interpretation different from the one Sattler gave it. Sattler, and most pathologists, would, of course, say this: If any micro-organism taken from a soil that possesses infective properties be carried through many successive artificial cultivations, all accidentally adhering matter would hereby become so diluted that it may be considered as practically lost; that is to say, the organisms of the further generations have become altogether free of that matter. If the organisms of these further generations still possess the same poisonous property as the original material, then we must conclude that this poisonous principle is identical with the micro-organism. I do not agree with this whole chain of propositions, although I agree with some parts. If a micro-organism be carried through several successive cultivations in a *fluid medium*, always using for inoculation of a new culture an infinitesimal dose, and as nourishing medium a comparatively large quantity of fluid, then, no doubt, carrying on the cultivations through four, five, or six successive cultures, any accidentally adhering original matter becomes practically lost, and if then the organism still possesses the same poisonous action to the same degree as the original material, then no doubt the conclusion that organism and poison are in this case identical becomes inevitable. But this is not the case with the jequirity bacillus. Taking from a poisonous jequirity infusion full of the bacilli one to two drops, and inoculating with it a test tube containing about four to five cc. of nourishing material, and using this at once *without previous incubation*, we find that even a few drops of this diluted fluid still possess a poisonous action. Precisely the same result is obtained by taking from a perfectly fresh jequirity infusion, *i.e.* before any organisms have made their appearance, one to two drops and diluting them with four to five cc. of distilled water. On using one to two drops of this diluted fluid for inoculating the conjunctiva of healthy rabbits, severe ophthalmia will be the result. After carrying on the cultivation of these bacilli started from a poisonous infusion, for a second generation in fluid medium, no trace of any poisonous action can be now detected, any quantity of such a cultivation is incapable of producing ophthalmia. Sattler used in his cultivations solid nourishing material, on the surface of which he deposited his drop

of poisonous jequirity infusion, containing the bacilli; after some days' incubation the bacilli having become greatly multiplied, he took out from this second culture a drop and transferred it to a new culture tube of solid material, and so he went on; every one of these cultures possessed poisonous action. Clearly it would, since he always used part of the original fluid deposited on the surface of the solid nourishing material. Part of this (being gelatine) became liquefied by the growth, but considering that Sattler started with infusions of considerable concentration—he left the seeds for many hours and days in the infusion—it is not to be wondered at that this would bear a considerable amount of dilution and still retain its poisonous properties. From all this we see, then, that the jequirity bacillus *per se* has nothing to do with the poisonous principle of the jequirity seeds, but that this principle is a chemical ferment in some respects (in its inability to withstand boiling) similar to the pepsin ferment.[1]

(*C.*) The third case, in which an experimental attempt has been made to transform a common septic into a specific or pathogenic micro-organism, is exemplified by the common mould, aspergillus, a mycelial fungus. But since this point has been discussed already in Chapter XV. I need not here enter into it again, suffice it to state that certain species of aspergillus possess the power of producing in the rabbit a general mycosis, and this power they possess *ab initio;* other kinds of aspergillus do not possess this character and cannot acquire it under any conditions.

Thus also this third case of a transformation of a common into a specific organism due to altered conditions of growth falls to the ground.

It might be now asked, How about those cases in which by injection of very small quantities of putrid organic substances,

[1] Since this has been in print, I became aware, that Messrs. Warden and Waddell published in Calcutta during the present year a most valuable memoir, detailing a large number of observations on the jequirity poison, which are in complete harmony with my own observations. They have definitely proved, that the active principle is a proteid—*abrin*—closely allied to native albumen; that its action is similar to that of a soluble ferment, that it can be isolated, and that it is contained, not only in the seeds but also in the root and stem of *Abrus precatorius.*

pyæmia or septicæmia, has been produced in rodents? Take the case of Davaine's septicæmia in rabbits. This disease has been produced in rabbits by Davaine, Coze and Feltz, and by many other observers, by injecting into the subcutaneous tissue of healthy rabbits small quantities of putrid ox's blood. The rabbits die in the course of a day or two, and their blood is found teeming with minute organisms, which prove to be bacterium termo; every drop of this blood possesses infective properties; when inoculated into a rabbit it produces septicæmia with precisely the same appearances as before. Pasteur and Koch have succeeded in producing septicæmia in mice and rabbits, and especially in guinea-pigs, by inoculating them subcutaneously with garden earth or with putrid fluid. This is Pasteur's septicæmia, or Koch's malignant œdema; it is characterised by œdema at the seat of inoculation, and spreading hence into the subcutaneous tissue of the surrounding parts. The animals die generally in twenty-four to seventy-two hours.

Koch has produced a peculiar septicæmia by the injection of small quantities of putrid fluids into the subcutaneous tissue of mice; the animals sometimes die in forty to sixty hours, and the white corpuscles of the blood are found crowded with exceedingly minute baccilli. Koch succeeded also in producing a pyæmia in rabbits by the injection of putrid fluids, this pyæmia being characterised by the presence of zooglœa of minute micrococci in the blood-vessels. He produced a progressive necrosis in mice by inoculating them with putrid fluids, the necrosis being due to the growth of micrococci which spread from the seat of inoculation, and destroy as they spread all the elements of the tissue. All these cases have been minutely described by Koch in his classical work, "Die Aetiologie der Wundinfectionkrankheiten, Leipzig," 1879.

I have in addition mentioned in Chapter VII. a micrococcus causing abscess and pyæmia in mice.

Now do these cases prove that septic micro-organisms, living and thriving in putrid organic fluids, can, when introduced into the body of animals, owing to some peculiar unknown condition, so change as to produce a fatal infectious disease? I must say, with Koch, who has very ably discussed all these points, No. Those organisms which are connected with the above morbid

processes possess this pathogenic power *ab initio,* not due to any peculiar condition of growth.

Amongst the legion of different species of micrococci and bacilli occurring in putrid substances, the greater majority are quite harmless. When introduced into the body of an animal they are unable to grow and to multiply, and therefore are unable to produce any disturbance. But some few species there are, which, although ordinarily growing and thriving in putrid substances, possess this power, that when introduced into the body of a suitable animal they set up here a specific disease.

One of the best studied cases is that of the bacillus anthracis. This organism is capable of growing well and copiously outside the body of an animal, it thrives well wherever it finds the necessary conditions of temperature, moisture, and nitrogenous material; when it finds access into the body of a suitable animal it produces the highly infectious fatal malady known as anthrax. The micrococcus of erysipelas is now well known through the admirable researches of Fehleisen to be capable of existence and multiplication outside the animal body; it grows well in artificial cultures, so does the tubercle bacillus of Koch, so does the bacillus which I described of swine-plague, mentioned in a former chapter, and so do other micro-organisms. Davaine's septicæmia in rabbits, Koch's septicæmia in mice, &c., &c., cannot be produced by every putrid blood or putrid organic fluid, only by some, only now and then, *i.e.* when the particular micro-organism capable of inducing the disease is present in those substances, and then only when it finds access into a suitable animal. Davaine's septicæmia of rabbits cannot be induced in guinea-pigs, Koch's septicæmia of mice cannot be induced in guinea-pigs, anthrax bacilli cannot induce the disease in dogs, and so with the other micro-organisms.

We conclude then from this that some definite micro-organisms, although as a rule existing and growing in various substances of the outside world, have the power, when they find access into the body of a suitable animal, to grow and thrive here also, and to induce a definite pathological condition. But this power they have *ab initio.* Those that do not possess this power cannot acquire it by any means whatever. Just as there

are species of plants which act as poisons to the animal body, and other species of plants which, although belonging to the same group and family, and although very much alike to the others, have no such power and cannot acquire such a power by any means, so there are micro-organisms which are pathogenic and others which are quite harmless. The latter remain so no matter under what conditions and for how long they grow.

I have made a series of experiments with the view of obtaining pure cultivations of definite septic micro-organisms: various species of micrococci, bacterium termo, and bacillus subtilis, of which the morphological characters could with precision be ascertained and which at starting were tested to be barren of any power of inducing disease. I have cultivated these in pure cultivations for many generations, and under varying conditions, and then I have inoculated with them a large number of animals (mice, rabbits, and guinea-pigs); and to put it briefly, I have not found that any of them acquired hereby the least pathogenic power.

CHAPTER XVIII.

VITAL PHENOMENA OF NON-PATHOGENIC ORGANISMS.

As has been stated in a former chapter, all putrefaction of organic matter is associated with micro-organisms. It is now generally admitted, because based on a large number of exact experiments (by Schwann, Mitcherlich, Helmholtz, Pasteur, Cohn, Burdon Sanderson, Lister, W. Roberts, Tyndall, and many others), that organic matter kept safe from becoming contaminated with micro-organisms of the air, water, and filth, remains free from them, and consequently from the form of decomposition which is generally considered as putrefactive; namely, the splitting up of high or complex nitrogenous compounds (proteids: colloids as well as crystallised bodies) into compounds of comparatively low or simple composition. These in their turn by oxidation ultimately yield ammonia and its salts, and nitrates of inorganic elements, with the simultaneous

development of certain gaseous and other products belonging to the aromatic series. The view now generally entertained by skilled observers is that the micro-organisms cause disintegration of nitrogenous compounds by withdrawing from the compound certain molecules of nitrogen, building up with these their own protoplasm. Similarly carbohydrates and inorganic salts, as phosphates, potassium, and sodium salts, are dissociated by them, inasmuch as they require a certain amount of carbon, phosphorus, potassium, and sodium, for building up their own bodies. In this process of decomposition certain alkaloids are produced, the composition of which is not accurately known, and which are called by the collective name of ptomaïnes (Selmi and others). These alkaloids are known to have a poisonous (toxic) effect when introduced in sufficient quantities into the system of a living animal. Very possibly the poisonous property of some articles of food, that have undergone putrefaction or some unknown kind of fermentation, is caused by some ferment, the product of micro-organisms (sausage poisoning, poisoning by bad fish and other articles).

Gaspard, Panum, Bergmann, Billroth, Burdon Sanderson, Gutmann and Semmer, and many others have shown, that by putrefaction of animal substances, a substance can be obtained —the septic poison or sepsin—which can be isolated by various chemical processes destructive of every living micro-organism, and which on injection into the vascular system of animals especially dogs, in sufficient quantities, produces a marked febrile rise of temperature, and is capable of causing death with the symptoms of acute poisoning, *e.g.* shivering, vomiting and purging, spasms, torpor, collapse and death. On post-mortem there is found severe congestion and hæmorrhage of the intestine, particularly the duodenum and rectum; hæmorrhage in the pleura, lungs, pericardium, and endocardium; congestion and hæmorrhage in the peritoneum. This *putrid infection,* or putrid intoxication, leads to death in twelve to twenty-four hours or even less. On injecting smaller quantities only a febrile disturbance is noticed, severe symptoms and death only following after injection of considerable quantities, such as several centimetres of putrid fluid. There is *a priori* no reason

why something like putrid intoxication should not occur as a pyæmic affection in the human subject; if, for instance, at an extensive wound, *e.g.* after amputation of a limb, a large surface of ulcerating tissue is established, on which, as is well known, numbers of putrefactive organisms are capable of growing; it is possible and quite probable, that here these organisms produce the septic poison, which when absorbed into the system in sufficient quantities produces septic intoxication. From this affection, septicæmia proper, due to the absorption by a small open wound or a vein of a specific organism, which increases within the body, and therefore is a living, growing, and self-multiplying thing producing fœtal septicæmia, must be carefully distinguished. As Lister has shown, under careful antiseptic dressing of wounds, putrid intoxication as well as septicæmic infection is rare or does not occur at all.

These putrefactive processes must be distinguished from certain fermentative processes, in the course of which by introducing a definite micro-organism—zymogenic organism—into a definite substance, definite chemical products are produced. Thus the torula cervisiæ or saccharomyces introduced into a solution containing sugar, produces alcoholic fermentation, *i.e.* oxidation and splitting up of sugar into alcohol and carbonic acid.

The bacterium lactis introduced into substances containing milk sugar, cane, or grape sugar, produces by oxidation a conversion of the sugar into lactic acid and carbonic acid. A micrococcus (see a former chapter) produces, according to Pasteur, the conversion of dextrose into a sort of gum, called by Béchamp viscose, and recognised by Pasteur as the cause of the viscous change of wine and beer. The urea in the urine is converted by the micrococcus ureæ (Pasteur) into carbonate of ammonium. Solutions containing starch, dextrin, or sugar, infected with the bacillus amylobacter yield, as mentioned in a former chapter, butyric acid. The same bacillus converts glycerine (Fitz) into butyric acid, ethyl-alcohol, &c. Alcohol is oxidised by the presence of a definite micrococcus (Pasteur) into acetic acid.

A species of minute bacillus subtilis produces from fats butyric acid (Pasteur, Cohn), and many kinds of micro-organisms

form pigmentary bodies, *e.g.* those producing the blue colour of milk.

What the chemical influence of pathogenic organisms on animal tissues may be is not yet known; and even when they grow outside the body, *i.e.* in artificial cultures, it is not yet known what their chemical effect on the nourishing material is, except that as is the case with all other organisms, putrefactive and pathogenic, they continue to grow and multiply as long as there are present the necessary substances, *i.e.* until the medium is "exhausted."

From the enormous number of micro-organisms present in the outer world, it is clear that the *rôle* they play in the disintegration of higher organic bodies into lower compounds, as well as in the building up of new compounds, is a very important one; to mention but one series, to wit, the enormous importance they have for the vegetable kingdom in reducing nitrogenous compounds to soluble nitrates of inorganic salts, so essential to the existence and growth of our common field-crops (Lawes).

One of the most interesting facts observed in the growth of septic micro-organisms is this, that the products of the decomposition started and maintained by them have a most detrimental influence on themselves, inhibiting their power of multiplication, in fact, after a certain amount of these products has accumulated, the organisms become arrested in their growth, and finally may be altogether killed. Thus the substances belonging to the aromatic series, *e.g.* indol, skatol, phenol, and others, which are produced in the course of putrefaction of proteids, have a most detrimental influence on the life of many micro-organisms, as has been shown by Wernich and others (see Antiseptics).

It is not well known whether in all or in some of these instances the organisms produce the chemical effects by creating a special zymogen or ferment, and through it causing the chemical disturbance, or whether they merely dissociate the compounds by abstracting for their own use certain molecules; but this much is known, that in consequence of this chemical disturbance definite chemical substances are produced. It is quite possible that the pathogenic, like the zymogenic, organisms

have this special character, that if the soil (animal body) contains a certain chemical substance, they are capable of growing and thus capable of producing a definite zymogen or ferment.

In many cases of putrefactive and zymogenic organisms a definite soil may be capable of furnishing suitable material for various organisms at the same time; as a matter of fact this is what one constantly meets with in ordinary putrefaction of vegetable and animal matter, which teem with various species of micro-organisms. But as a rule it will be observed that one species is more apt to find a suitable soil in this substance than others; and then it will be found that this one organism, above all others, grows more numerously; and when it has done growing, that is, when it has exhausted its own peculiar pabulum, another organism, not dependent on this, but on some other substance still present, makes a good start and multiplies accordingly. Thus one finds constantly that a fluid, supposing it contains a variety of proteids, carbohydrates, and salts, having become infected with micrococcus, and various species of bacilli, in the first days or weeks chiefly micrococci are present; afterwards, when the micrococci have done multiplying and sink to the bottom of the fluid, this latter gradually becomes filled with a variety of bacilli. Or if micrococcus and bacterium termo be sown at the same time in a suitable fluid, we find that at first only the bacterium termo increases rapidly; afterwards, when this has ceased multiplying, the micrococcus takes the field. In still other cases, as in putrid blood, exudation fluid, and particularly in putrefying solid parenchymatous or other substances, various kinds of micro-organisms grow on simultaneously in different parts of the material.

The same holds good for the zymogenic organisms. A solution containing sugar is a very fit soil for saccharomyces; when this has exhausted the material, *i.e.* when all the sugar has been split up into alcohol and carbonic acid, the latter escaping as gas, then the material is ready for the organisms capable of converting the alcohol into acetic acid. The two kinds of organisms may be, however, growing at the same time, the saccharomyces leading.

Septic or putrefactive organisms then, like zymogenic and pathogenic organisms, are *cæteris paribus*, dependent for their

growth on the presence of the suitable nourishing material. And, as we have seen, they differ materially from one another in this respect; while putrefactive organisms find in almost all animal and vegetable fluids the necessary substances for nutrition, the zymogenic and pathogenic organisms are much more limited in these respects. Where there is no alcohol present the organisms producing the acetic acid fermentation cannot grow; where there is no sugar or a similar substance present the saccharomyces cannot grow, and so also a particular pathogenic organism—the bacillus anthracis—cannot grow in the living tissues of the living pig, dog, or cat, but grows well in those of rodents, ruminants, and man; the bacillus of swine-plague grows well in the pig, rabbit, and mouse, but not in the guinea-pig or man.

Septic organisms differ also from pathogenic organisms in this, that the former are capable of growing in fluids containing only simple nitrogenous compounds, *e.g.* tartrate of ammonia, whereas pathogenic organisms require more complex combinations, proteids or allied nitrogenous substances. Thus, for instance, in Cohn's and Pasteur's fluids septic micrococcus, bacterium, and bacillus grow well and copiously, but pathogenic organisms absolutely refuse to grow in them; even bacillus anthracis, which appears the least selective, cannot make a start in it. Some organisms, *e.g.* tubercle-bacilli, require the most complex nitrogenous compounds; they refuse to grow, for instance, in broth in which anthrax-bacilli, bacilli of swine-plague, and the micrococcus of diphtheria and erysipelas grow well.

All septic and zymogenic organisms properly so-called, and described in former chapters, differ in this essential respect from pathogenic organisms, that the former two absolutely refuse to grow in the living tissues of a living animal.

As was stated in former chapters, it is not at all uncommon to find masses of micrococci in tissues which during the life of the subject have become dead or necrotic, or so severely changed by inflammation or otherwise that they may be considered as practically dead. In the diseased, necrotic, intestine, liver, or spleen, in abscesses, in the subcutaneous, submucous, or parenchymatous tissues, masses of micrococci have been noticed

which in no way bear any intimate relation to disease, merely finding in the dead or severely diseased tissues a suitable nidus for their growth and multiplication. But they may be present even in organs which show no severe disorganisation; thus, for instance, in fatal cases of small-pox, typhoid fever, pyæmia, even infantile diarrhœa, masses of micrococci may be found in and around the blood-vessels in the liver and spleen. In all these cases the micrococci are capable of growing, because owing to the severe general disorder these tissues have before the actual death of the patient lost their vitality, and, consequently, are unable to resist the immigration and settlement of the micrococci. Of the same character are the masses of bacilli one meets with sometimes in the intestinal wall, liver, and mesenteric glands after death from severe disorder of the bowels, *e.g.* typhoid fever and dysentery. I cannot for a moment accept the view of Klebs and Koch, that the presence of the bacilli mentioned in a former chapter necessarily stand in any causal relation to the disease, seeing that they are not constant, and particularly that they are found in organs directly connected with the intestines, which we know are in typhoid fever in an intense state of disorganisation.

The question arises: Where do the micrococci and bacilli come from which are thus capable of settling in a dis organised tissue even during the life of the subject? There can be no doubt that as regards the intestinal wall, the mesenteric glands, the liver, and the spleen, the organisms could readily, in cases of severe disorganisation of the intestine, immigrate from the cavity of the bowel, where they are normally present, into the wall of the intestine, and moreover be absorbed together with the products of disorganised tissue into the mesenteric lymphatic glands, the liver, and the spleen. Further, it is not difficult to explain that if a focus of inflammation or necrosis be set up at various internal places in consequence of emboli carried from an inflammatory focus to which micrococci or bacilli from the outer world have access, *e.g.* the skin, alimentary canal, respiratory organs, these internal places or metastases would harbour the same organisms, and as soon as disintegration—abscess, caseation, or necrosis—takes places in these metastases also the imported organisms would multiply

to a great extent, the tissue being shut out from the circulation and practically dead.

All this I say is not difficult of explation if we bear in mind that the products of an inflammatory focus to which organisms have ready access from the outer world become themselves a ready nidus for these organisms; and when some of these products are absorbed and taken into the general circulation to act as emboli, and thus to set up inflammation in distant regions, the organisms, embedded in and shielded by those products from any destructive action the living blood in the circulation may be capable of exerting, are thus transported to the new foci of inflammation and disintegration resulting from the emboli. All this is self-evident, and does not require more proof than what is already known, and it follows from such considerations that the presence of micrococci and bacilli in the tissues of internal organs in severe cases of disease, when some of the organs become disorganised before the actual death of the body, or in secondary foci of severe inflammation and necrosis, may have no connection whatever with the original cause of the disease or necrosis, but may be, and probably are, simply due to a transportation and immigration of non-pathogenic putrefactive organisms.

A most striking case of this kind I met with in mice dead of swine-plague; the bowels were severely inflamed, and in the liver there were present necrotic patches, an almost constant symptom of the disorder; in such necrotic patches the capillary blood-vessels are sometimes, not always, found distended and plugged with the zooglœa of putrefactive micrococci, which have nothing to do, specifically, with the real disease (see a former chapter).

The cavity of the alimentary canal, small and large intestine, especially the latter, contains under normal conditions innumerable masses of putrefactive micro-organisms. These being much smaller than chyle-globules must of necessity be as easily absorbed as the latter by the lacteals, by which they are carried into the general circulation; but being putrefactive they are unable to exist in the normal blood and normal tissues, and, therefore in healthy conditions perish. But if there be in any part a focus of disorganisation they can settle there and

propagate, provided they get there through the blood in a living condition. Many experiments prove that they cannot pass unscathed through the normal healthy blood, and therefore it is not probable that they would reach such a focus in a living state; but let them be well inclosed in a solid particle, say of disorganised tissue, and then carried through the vascular system, and we can quite understand that in this state, *i.e.* in and with that particle, they may reach the distant focus in a living state, and if in this focus the conditions are favourable for their growth, *e.g.* if there is inflammation and necrosis, we may expect them to multiply accordingly.

It is now admitted by most competent observers that in the healthy and normal state the blood and tissues contain no micro-organisms whatever, and that the assertions to the contrary are due to errors in the experiment, *i.e.* to accidental contamination. I will on this point merely refer, amongst many others, to the observations of Watson Cheyne [1] and F. W. Zahn.[2] Consequently it cannot be maintained that if in any focus of disintegration micro-organisms make their appearance they are derived from those normally present; we must, on the contrary, believe that putrefactive organisms can be imported from parts connected with the outer world into distant localities in which disorganisation of tissues has taken place.

It is clear from the foregoing, that after death micro-organisms will readily immigrate into the various tissues, and in this respect those organs situated near places where under all conditions micro-organisms exist will be the first to be invaded by them; *e.g.* the lungs, from micro-organisms present in the bronchi and air-cells derived from the outer air, the walls of the alimentary canal, the mesenteric glands, the peritoneal cavity, the liver, and the spleen. The bacilli possessed of locomotion are particularly to be mentioned in this respect, but other non-motile bacilli and micrococci also find their way into these organs; thus Koch [3] saw only a few hours after death bacilli (non-motile) present in the blood of the arteries of a healthy person who had died by strangulation.

[1] *Pathological Transactions*, vol. xxx.

[2] *Virchow's Archiv*, vol. xcv.

[3] *Pathogene Micro-organismen.*

CHAPTER XIX.

VITAL PHENOMENA OF PATHOGENIC ORGANISMS.

As has been stated in the preceding chapter, the specific micro-organisms have the great differential character that they are capable of existing and propagating themselves in healthy living tissues. In those species in which the complete series of proofs has been furnished to establish the fact that the micro-organisms are intimately associated with the cause of the malady, *e.g.* malignant anthrax, tuberculosis, swine-plague erysipelas, in which it has been shown beyond doubt: (*a*) that an animal suffering from the malady contains in definite distribution the particular micro-organism, (*b*) that the micro-organisms, cleared by successive artificial cultures from any adhering hypothetical chemical virus, when introduced into a suitable animal produce the malady, (*c*) that every such affected animal contains the micro-organism, in the same distribution and relation to the diseased organs as the original animal dead after disease—in those instances, I say, the only way of understanding the effect of the micro-organisms is to assume, what is actually the case, that the micro-organisms introduced into the living tissue go on multiplying, and directly or indirectly, *i.e.* themselves or by their products, as will be stated below, produce certain definite disorders in the different parts. In the most favourable cases (anthrax, tuberculosis), a single organism introduced into a suitable locality in the animal body will be capable of starting readily a new brood. But in other cases it is necessary that an appreciable number of the organisms be introduced in order to start a brood. This was the case in some of the septicæmic processes in rodents studied by Koch.[1] The period between the time of introduction of the organism into the body (blood, skin, or mucous membranes, subcutaneous tissue, lungs, alimentary canal) and the production of the new brood large enough to produce a definite effect locally or generally, corresponds to the incubation-period of the disease,

[1] *Infectionskrankheiten*, *loc. cit.*

and as is well known there is in this respect a great difference in the different diseases. Thus in anthrax the introduction of the bacilli into the subcutaneous tissue of a suitable animal is followed after from sixteen to twenty-four hours or more by a local effect (œdematous swelling), and a few hours after by general constitutional illness, when bacilli can as a rule be found in the blood. On the other hand in tuberculosis after the introduction of the *bacilli tuberculosis* into the subcutaneous tissue, the nearest lymph-glands show the first signs of swelling and inflammation after one week or even later, and the general disease of the internal viscera does not follow until one or two more weeks have elapsed. This is also borne out by observations of the behaviour of these bacilli in artificial cultures; whereas a suitable material inoculated with the bacillus anthracis and kept at the temperature of the animal body (38° to 39° C.), shows already after twenty-four hours a good crop of the bacilli; in the case of the tubercle-bacilli the first signs of a new brood are not noticed, as Koch has pointed out, and as I have had in several instances occasion to verify, before ten to fourteen days have passed.

(*To be continued.*)

ON THE INTERVAL TREATMENT OF BRONCHITIS.

BY EDWARD DRUMMOND, M.D., ROME.

THE leading points to be observed in the management of the various forms of bronchial inflammation, are, as a rule, sufficiently manifest and easy of application, so that when called in to such cases there is little need for hesitation in the choice of remedies. Such periods of attack are of course, especially at the extremes of life, times of the greatest alarm, anxiety, and pressing danger to the patient, who is apt, however, to think that, when they have passed away, all is well again, and for this reason we commonly lose sight of him until another seizure compels him again to seek our aid.

We know, however, that this is very far from being the case; that very often his condition in the interval is very critical; that the latent cause, of which the bronchitis is only a secondary consequence, is still present; that the interval is the period when really *curative* treatment is available, and is the most important part of the life-history of his disease.

As time goes on, if no attempt is made to deal with the diseased condition to which the bronchitis is due, recurrences are more and more frequent; and if the patient is still exposed to the exciting cause, especially in a variable climate, they come to be taken as a mere matter of course, and serve to mark the winter exactly like the return of snow and fog. The patient is hardly ever well, and becomes habituated to a condition of permanent disablement; his power of resistance to weather changes is diminished, and a barometric sensitiveness to them is developed. In the background steadily advancing hidden lesions lurk; and increasing emphysema, heart dilation, lung collapse, interstitial lobular pneumonia, dilatation of the

bronchi, and other changes progress, slowly but surely sapping the patient's strength, shortening the duration and diminishing the enjoyment of life; so that, although chronic bronchitis is, *per se*, attended with comparatively little danger to life, it none the less originates or aggravates other lesions, with which its clinical history is interwoven, and often in their nature more perilous than itself. It is not wholly our fault that the patient is withdrawn from our surveillance during the interval, for he, deeming himself "whole," thinks that he "needs not a physician;" but a word of caution and advice might enable us to exercise a controlling influence over him when not actually ill in the strict sense of the word.

The object of this paper is to urge the importance of this, and to point out some particulars in which the patient is liable to suffer from lack of guidance, for I have been increasingly impressed with the frequency with which during the twenty years of my professional life I have been consulted for their "bronchitis" by people who had no suspicion that they had any other contingent malady requiring treatment.

It is obviously impossible for me to enter largely into the pathology, etiology, &c., of bronchitis, which have been done ample justice to in many treatises by contemporary physicians.

I will only select a few types constantly turning up in daily practice which may serve to illustrate my meaning.

No. 1 is a feebly vitalised, anæmic girl, with a phthisical family history. Her laryngeal mucous membrane is shown by the laryngoscope to be pale, with perhaps here and there a weak ulcer. The bronchitis here is a mere incident, and the all-important thing is to face the threatened phthisis by pure air, good food, exercise, iron, and cod-liver oil.

No. 2 is a woman beyond the menopause, with weak and flabby muscles, blueness of the lips, and undue fulness of the veins of the skin of the face; is short-breathed, nervous, and has an anxious look; takes little outdoor exercise, says "she cannot"; sleeps badly, and wakes suddenly. I hardly need the aid of the pulse and stethoscope to tell me that she has dilatation of the heart and probably mitral disease. Digitalis, with potash and a bitter tonic, saline aperients, nourishing food in small

quantities, whisky-and-water as a stimulant, abandonment of her overheated room for passive or gentle walking exercise in the open air, will postpone the catastrophe for years, and are more important than the squills, ammonia, and senega of the actual attack.

No. 3 is an old gentleman, manifestly gouty, with early kidney changes, subject to headache, and feeling generally *gêne;* has small patches of eczema somewhere about him; has been to German baths and lived according to order, but took it upon himself to add champagne, Curaçoa and black coffee, perhaps ice creams, to the usual regimen. His sole chance of escape from disaster is to live simply by strict rule on a diet largely consisting of vegetables, fish, eggs, milk, poultry, with dry sherry or whisky-and-water; tepid sponge baths, warm underclothing; to avoid club life, with its temptations to dietetic errors, and the society of people like himself; to spend his winters in the south of Europe or on a sea voyage, and his summers on bracing upland moors. Iodide of potassium and arsenic with chiretta will do good, and tepid Carlsbad or Hunyadi Janos water.

No. 4 is a strong, florid, muscular young man who hunts, shoots, *lives well* in conventional phrase; has a good appetite, enjoys life, but is becoming plethoric; has wheezy breathing, shooting pains in his fingers or toes—or dull aching in the soles of the feet or near a large joint; has had attacks of "red sand" in his urine; perhaps has a neuralgia. He must learn to live *within his powers,* to restrict his diet especially in meats, to abjure strong wines, malt liquor, and take a minimum of alcohol in any form, to put his trust in Epsom salts and exercise. He may live to a long age, for the declining vital power of age is conservative of such; but without prudence he will develop the condition of the last —No. 3.

I will only add one other out of endless types. It is a common one. No. 5 is a lady, refined, delicate all her life, inclined to anæmia, with little physical power, but mentally acute and bright, has accustomed herself morbidly to watch the weather as a natural foe, has become a subtle meteorological machine, keeps her warm room for long periods, her heart is

weak but otherwise normal, her bronchitis is a bronchorrhœa. She has engrafted on her other ailments a decided hypochondriasis; and, depriving her liver of the natural stimulus of exercise, employs probably podophyllin or some quack pill instead. This kind of person is a chronic trouble. Nitric acid with compound infusion of gentian and cascara as a tonic aperient, will be of service. Iron she cannot digest, quinine gives her headache, she is liable to become homœopathic at any rate when not seriously ill, but a thorough change in her mode of life is needed, and a "hardening" process. "Je n'ai pas obtenu de guérison." Dr. Greenhow has well said that "Bronchitis is not so much excited by exposure to any particular degree of cold, as to alterations of temperature; and a patient confined to his room sometimes feels changes of temperature more than those that go abroad. Indeed, persons who live in heated rooms, and screen themselves from every draught of air, sometimes become so susceptible that even accidental cooling of the apartment proves as injurious as a much more serious exposure would to persons of ordinary habits." Keep up the circulation, give tone to the mucous membrane and system generally, and judiciously accustom the patient to external temperature and open air exercise.

A CONTRIBUTION TO THE STUDY OF DISINFECTANTS.

BY J. W. MILLER, M.D., DUNDEE.

THE question of disinfection and the relative value of various means which have been employed for this purpose has appeared to me to be a subject of sufficient practical importance to warrant me in hoping that my selection of it, as a profitable one to bring under your notice to-day may meet with your approval. It is one which is constantly coming before us in our daily work, and whether we consider the initial cases of an epidemic, or the outbreaks of the disease in individual households, after the epidemic has become established, the importance of efficient disinfection can scarcely be overrated. It is, therefore, a duty incumbent on us to increase our knowledge of this subject, so that we may be able with confidence to select a disinfectant which is fairly efficient for its purpose, and to direct those under our guidance as to how they must use it in order to secure the accomplishment of the end we seek.

Perhaps the first point to be established is, whether complete disinfection is practicable, because if we may judge by the manner in which it is often gone about, it would almost appear to be looked on by some as not of very great consequence, but as a sort of harmless fancy which may be humoured. A disinfectant may be defined as an agent which has the power of so acting on the emanations given off by a person suffering from an infectious disease, as to deprive them of the power which they possess of conveying the disease to the healthy. What is the nature of these emanations? It is now almost certainly established that their active part, the contagium

proper, is particulate. It is not a volatile gas, but minute particles of living matter, and it is these minute particles which must be destroyed. It has been well established that such particles constituted the active contagium of vaccine lymph. Beale discovered them in 1863 and was satisfied that they were the infective element, and he has been confirmed by Chauveau, Burdon Sanderson, Braidwood and Vacher, and others. The particles are so minute—Burdon Sanderson says not greater than $\frac{1}{20000}$ of an inch—as to pass every filter, and they do not subside, but their separation has been accomplished by diffusion so as to procure a supernatant fluid entirely free from them, and it has been repeatedly proved that this fluid has no infective property. This fact has also been established as regards the virus of small pox, sheep pox, and glanders. Further evidence that contagium is not volatile, has been furnished by Chauveau. He evaporated portions of the virulent liquids supplied by cases of small pox, sheep pox, and cattle plague, and having condensed the vapour given off, he found that the liquid so procured was entirely free from infective property. In this connection reference must not be omitted to the researches of Koch, Pasteur, and others, which show that bacteria and their spores obtained from the virulent fluids of splenic fever, chicken cholera, &c., and propagated by successive cultivations so that they could not be accompanied by any other noxious matter from the original source, are yet active in reproducing the disease from which they were obtained. It is reasonable, therefore, to infer that all contagia present themselves in this particulate form.

These particles, then, being the object of our attack, we have to bear in mind where they are to be found. They float in the air of the sick room, whence they may be wafted through the house if the air currents tend in this direction, and attach themselves to the walls, ceiling, and floor, to furniture, bedclothes, clothing of attendants, and to utensils, books, toys, &c., which may be in their way. A disinfectant, therefore, if it is to be of any use, must be such as can come freely, and for a sufficient length of time, and in a sufficient degree of concentration, into intimate contact with the contagium particles in all these situations. It must therefore be fluid to fulfil some of

these conditions and gaseous for the particles floating in the air.

Of many of the agents which are in repute for this purpose it has to be emphatically stated, that when employed in such a manner as constantly comes under our notice, for example, saucers of Condy's fluid, chloride of lime, sanitas, &c., placed about the sick chamber, they are perfectly useless. And a sham disinfectant, or even a real one inefficiently applied, or applied too early, is a most dangerous delusion and a snare, creating a sense of security where there is none, and positively thus favouring what we are seeking to prevent, the spread of disease. In my opinion premature and inefficient disinfection is at least one principal cause of the failure to arrest epidemic disease which has been strongly remarked upon in discussing the results of the proceedings of sanitary authorities in towns where intimation of infectious disease is enforced.

The assumption that whatever covers an offensive odour, or tends to arrest putrefaction, is therefore a true disinfectant has been the source of considerable misconception. For example, a solution of carbolic acid in the proportion of $\frac{1}{3}$ per cent. suffices to preserve bread pulp, $\frac{1}{5}$ per cent. flesh broth or milk, and although the vapour of carbolic acid appears to be nearly impotent against contagium, it will prevent for months the putrefaction of a piece of meat, permanganate of potash also, and chlorine in a strength quite inadequate to kill contagium, act in the same manner. In these instances the action is that of an antiseptic, which Dr. Baxter defines as a body "fatal to the growth and multiplication of microzymes," which invariably accompany putrefaction. There is a considerable difference, however, between the strength of an antiseptic which is necessary to preserve a fresh substance from the commencement of putrefaction, and that required to arrest putrefaction, that is, to kill microzymes after they have gained an entrance, the latter operation approaching more nearly what is required for disinfection. The fact, therefore, that an agent arrests putrefaction is no proof that it will, at least in the same degree of concentration, destroy contagium.

Much difficulty in the settlement of this question arises from the fact that in most diseases it is almost impossible to

obtain positive proof of the efficacy of a disinfectant. We cannot get hold, for example, of the actual contagium of scarlet fever and subject it to experiment, and even if we could it is obviously out of our power to put a supposed disinfected specimen to the test on a healthy human subject. But we can make some approach to a practical test in the case of one contagium, which is always at hand, and can be safely employed, and on the human subject, that is, vaccine lymph. And this contagium has been made the subject of numerous and scientifically exact experiments, amongst others by Dr. Baxter, Messrs. Braidwood and Vacher and Dr. Dougal.

But before going further it is important to know that nature has means of her own always in operation in destroying infective matter. Free exposure to the air almost certainly in process of time accomplishes this purpose, but it is not possible to state what length of time is required. Braidwood and Vacher have found that vaccine lymph mixed with water loses its infective power in proportion to the time of exposure ("Second Report on Life History of Contagion," p. 39, *British Med. Journ.*, 1877, vol i.). Free ventilation is therefore of the first importance. On the other hand if infected articles, as clothes, books, &c., are shut up from the air, it is impossible to say how long they may retain their dangerous properties.

Another and more sure, as well as more rapid, agency steadily at work is putrefaction. In the course of his researches, Dr. Baxter when working with a preparation of the virus of infective inflammation, which, when fresh had been proved a virulent poison, inoculated a guinea-pig with another portion of the same preparation, but no symptom of illness resulted; the explanation of the failure being found in the fact that the virus had become putrid (Rep. of Med. Off. of Priv. Coun., 1875, p. 232). In an experiment with the virus of glanders, there was from the same cause no effect beyond sligh local tenderness (p. 243), and he states "that putrefactive change occurring in the virus of vaccine, in that of experimental septicæmia, and in that of glanders, appeared invariably to destroy their specific infective power." Dr. Klein has made the same observation regarding anthrax (*Brit. Med. Journ.*, May 31, 1884, p. 1052).

Of artificial methods of destroying contagion perhaps the

first which should be noticed is heat. This has been made the subject of exact experiment with vaccine. Braidwood and Vacher consider their proof nearly conclusive that 149½° F. is the lowest temperature which can be relied on for its destruction (Second Report, &c., p. 43, *Brit. Med. Journ.* 1877, vol. i.). Their observations seemed further to prove that a few minutes' exposure was as effectual as two hours. Thirty seconds failed to disinfect, probably, they say, because the time was too short to allow the whole body of lymph to be heated to this point. A temperature 17° to 26° higher than this failed in Dr. Baxter's hands (Report of Med. Off., &c., 1875, p. 229), to destroy vaccine as he successfully vaccinated at these points with lymph which had been exposed for thirty minutes to a temperature ranging from 167° to 176°, but its infectivity was absolutely annulled by temperatures above 185°. A lower temperature is compensated for, however, to a certain extent by a longer exposure.

This observer quotes Davaine's researches on the effect of heat on charbon virus. This virus is a very intense one, Davaine having found so small a dose as even $\frac{1}{1000000}$ of a drop of the blood of an animal affected with the disease sufficient to kill a guinea-pig, when injected into the areolar tissue, and without any sign of local irritation. The undiluted blood was completely disinfected by exposure for fifteen minutes to a temperature of 51° Cent. (124 F.), and when diluted with a very large excess of water a temperature of 48° for fifteen minutes, or 50° for ten minutes, or 55° (130° F.) for five minutes, was effective. These results were with moist heat, but he found that when the blood was dried over calcium chloride, it stood a temperature of 100° Cent. (212° F.) without its virulence being impaired.

It is stated by Dr. Russell (*Quain's Dict.* p. 398) that "it is extremely improbable that any contagium can withstand a temperature of 220° Fahr. maintained during two hours," and this conclusion is supported by the experiments now quoted. Now as Dr. Ransom has shown that fine fabrics do not begin to scorch till a temperature of 255° to 260° has been reached, which is 70° to 75° above the temperature which Dr. Baxter found certainly destructive of vaccine, we have a wide margin in the practical application of this agent.

Sulphur, or rather the product of its combustion, sulphurous

acid gas or sulphur dioxide, has a very old reputation as a disinfectant, and experimental investigation proves that it has powers which undoubtedly place it in the first rank for this purpose. Its destructive power on vaccine lymph has been tested by various observers, both by exposure of the lymph to the vapour and by mixture with the aqueous solution.

Mere dilution, it must be observed, does not destroy the activity of vaccine. Braidwood and Vacher made the following experiments with vaccine and the aqueous solution ("Report on Life History of Contagion," p. 28, *Brit. Med. Journ.* 1876, vol. ii.) mixed in equal proportions. Twelve children were inoculated at twenty-seven points, and all the vaccinations failed except in the case of one child, and as it presented three good vesicles, it was clear that the lancet must have had on it the remains of some good lymph; the other children were subsequently vaccinated with success. A heifer was inoculated with a like mixture at eleven points and gave only two doubtful vesicles, and as it was afterwards vaccinated successfully it was evident that the two doubtful vesicles had been spurious, and that the virus of the lymph had been destroyed. Another heifer was inoculated at twelve points with a mixture of six tubes and four drops of the solution, and the vaccination was a failure, subsequent vaccination being successful. They found the gas equally effective. Lymph which had been exposed in a watch glass all night to the fumes of ignited sulphur being used to vaccinate children, the vaccinations failed and the efficiency of the disinfection was corroborated by subsequent successful vaccination.

In the *Glasgow. Med. Journ.*, for 1873 (vol. v. p. 41) Dr. John Dougall publishes a series of experimental observations on disinfectants. His method of testing a gaseous disinfectant was to expose vaccine lymph for twenty-four hours to the action of the vapour, at the expiry of which time the dried spot was moistened with glycerine and water and the mixture preserved in a capillary tube for use, the whole contents of one tube being used at one insertion. Two experiments were made with sulphurous acid gas, and in both the vaccination was abortive.

Dr. Baxter's report on an experimental study of certain disinfectants furnishes equally strong evidence as to the efficacy

of this substance. The contagia experimented on by him were vaccine, virus of infective inflammation and glanders. He first ascertained by experiment that lymph desiccated by exposure under a bell-glass over concentrated sulphuric acid for fifty-two hours was not impaired. His result with vaccine was that lymph exposed for only ten minutes to the fumes of burning sulphur was rendered totally barren. The experiments which led him to this conclusion were on four children, whom he inoculated at three points on one arm with pure lymph and at three points on the other arm with disinfected lymph (p. 226). He found also that sulphurous acid when present in the proportion of 2·9 per cent. destroyed the infectivity of the virus of infective inflammation (p. 237), the virus being obtained from the abdominal cavity of guinea-pigs which had died of infective peritonitis. The efficiency of this agent against the virus of glanders, he also conclusively established. A strongly virulent solution of the poison having been prepared by a method of which I need not here detail the particulars, a portion was mixed with an equal quantity of sulphurous acid solution containing 8 per cent. of the gas (p. 244) and ten minims of this mixture was inoculated on a donkey with no further effect than a little thickening at the spot inoculated. The intense virulence of the same liquid, when not disinfected, was conclusively shown by the fatal result on other animals operated on.

Four experiments were made by myself to ascertain how short a time might suffice for this agent to produce its effect. In one the aqueous solution was mixed with an equal quantity of lymph immediately before use, and the vaccination was successful; in three the lymph was first rubbed in, and immediately thereafter the germicide, with the result that in one the lymph produced a good vesicle, but in the other two was barren.

I may be allowed to digress for a little here to state the method I adopted in experimenting with this and some other disinfectants, and to express my thanks to several of my friends for the assistance they have cordially given me by making observations amongst their vaccination cases, by which I have been enabled to collect in all eighty-four observations.

Taking a well-filled tube of lymph, I preserved a portion

undisinfected, with which I inoculated at three points, inoculating a fourth point on the same arm with the disinfected portion of the same tube, thereby securing absolute uniformity of conditions. Braidwood and Vacher object to the simultaneous inoculation with pure and disinfected lymph, on the ground that the development of true vesicles may withdraw energy from the point inoculated with lymph perhaps only weakened by the germicide, and thus afford a fallacious appearance of its efficacy. But I cannot see that this result is a probable one, and the simultaneous method is that which has been generally followed. We know that when in ordinary vaccination the result threatens to be insufficient, and we make a new insertion with fresh lymph, if it proves a success, so far from withdrawing from the development of the imperfect vesicles, the latter become reinforced in energy; so that I would expect that the systemic infection from the pure lymph would assist any remaining power in an imperfectly disinfected lymph, and therefore, if, notwithstanding this, it is a successful germicide, it is all the stronger proof of its activity.

Braidwood and Vacher quote some observations by Crookes (Report, p. 24, *Brit. Med. Journ.* 1876, vol. ii.) on the efficiency of the vapour of sulphurous and carbolic acid against the spread of cattle plague. "In a farm in which the disease was pursuing its course unchecked, it suddenly stopped on sulphurous and carbolic acid being freely used, though the disease in the immediate neighbourhood continued unabated. Again, a healthy beast and a sick one were placed together in a shed, the atmosphere of which had been first saturated with sulphurous acid, and then with carbolic acid vapour. Though there was actual contact between the animals, the healthy one did not take the disease for a month, and then only in so mild a form that it recovered in a few days. The following is an experiment on a large scale. The cattle belonging to a farm in an infected neighbourhood were divided into two lots, forty-five being placed in houses treated with sulphurous and carbolic acid, and twenty-eight in *open* sheds not so treated. On the same day the disease was introduced into each lot by inoculation, and it was found that of the forty-five, only those actually inoculated took the disease, while of the twenty-eight, the whole number took

it and died." It is unfortunate that two disinfectants were used, but from what will presently be stated when treating of carbolic acid, it will appear more than probable that the active agent was the sulphurous acid.

Dr. Dougal mentions a crucial experiment which was performed during the prevalence of the plague at Moscow in 1770 with the fumes of a disinfecting powder, of which the chief ingredients were nitre and sulphur. It was determined "that ten malefactors under sentence of death should, without undergoing any other precautions than the fumigation, be confined three weeks in a lazaretto, be laid upon the beds, and dressed in the clothes which had been used by persons sick, dying, and even dead, of the plague in the hospital. The experiment was accordingly tried, and none of the ten malefactors were then infected or afterwards became ill."

These experiments with sulphur embrace vaccine, virus of infective inflammation, glanders, cattle plague, and the plague at Moscow, and afford conclusive proof that sulphurous acid gas is a most certain destroyer of contagium. Dr. Watson Cheyne considers it one of the best antiseptic lotions, mixed in equal proportion with water or glycerine (*Antiseptic Surgery*, p. 269). Dr. Baxter ascertained that in the proportion of ·123 per cent. it arrested the growth of septic microzymes, a much weaker proportion than was required for disinfection.

Carbolic acid is probably the next most widely-used substance at the present day, and it has undoubtedly high claims to its position. Employed to destroy vaccine by Braidwood and Vacher, they got the following results ("Report on Life Hist. of Contag." p. 28, *Brit. Med. Journ.* 1876, vol. ii.). Using a mixture of equal parts of lymph, and a watery solution of carbolic acid (1 in 20), they inoculated seven children; in three the vaccinations were abortive; in one of these, however, the child proved to have been in the incubation period of relapsing fever; another of the three was subsequently vaccinated with success, proving that the failure had not been due to insusceptibility, and therefore the success of the disinfection; in the cases of the other four children, ten points of insertion yielded six vesicles. In all these seven instances the disinfected lymph was applied immediately after mixture. A $2\frac{1}{2}$ per cent.

solution,[1] therefore, with so short a time allowed for its action, cannot be relied on to kill the contagium. Another set of four children were inoculated with a similar mixture, but after it had been preserved in tubes for seventeen days, three, four, and six weeks respectively, and these inoculations all failed. But these successes have no weight to prove the value of carbolic acid as a disinfectant for practical purposes, the time required being obviously too long. They also operated on heifers with the same mixture, obtaining two or three doubtful vesicles for twelve insertions. Some other experiments were made with so large a proportion of the germicide (1 in 4) and with carbolate of glycerine, that, though they showed the certainty of the disinfection, the result is not of practical value.

Dr. Baxter concluded (Report, p. 225) from his observations that carbolic acid solution of 1 per cent. or less had no effect on vaccine, that between 1 and 2 per cent. its action was irregular, but that 2 per cent. "seems enough to destroy its infective power with certainty." This conclusion, namely, that 2 per cent. is effective, is deduced from three cases, in each of which three insertions were made on one arm with pure lymph, and three on the other arm with disinfected lymph.

It will be observed there is a discrepancy here between his results and those of Braidwood and Vacher; but as the latter used the lymph immediately after mixture, and the interval allowed by Dr. Baxter is not stated, the difference of result is probably thus explained. Carbolic acid vapour was tested on lymph preserved on ivory points (p. 226), the points being fixed in the stopper of a four-ounce glass bottle, so that the dried lymph was within half an inch of the surface of nearly pure carbolic acid. They were kept in this situation for periods varying from five minutes to sixty. Lymph exposed thus for less than thirty minutes was unimpaired; one specimen exposed thirty minutes produced two vesicles for three insertions, but another exposed for the same period was destroyed, as were also two specimens exposed for sixty minutes. But as it is manifestly impossible to apply carbolic vapour in this degree of concentration in practical disinfection, and looking

[1] The 5 per cent. solution employed being diluted one-half by the mixture with an equal quantity of lymph.

at its complete failure under thirty minutes' exposure even in this strength, it is evident that, as measured by its effect on vaccine, it is absolutely untrustworthy for our purpose. This germicide was found by Dr. Baxter to have more efficacy against the virus of infective inflammation. It was allowed to operate for a time varying from thirty minutes to three hours, but the reporter states that the disinfection appeared as effectual in five minutes if the fluids were thoroughly mixed (p. 231). He concludes from eight or nine experiments that carbolic solution in the proportion of 1 per cent. or more, appears to deprive the virus of all infective power (p. 237).

Dr. Baxter quotes some experiments by Davaine (p. 237) on the virus of malignant pustule. Operating on guinea-pigs with a liquid which, undisinfected, caused death in from one to four days after inoculation—occasionally, though rarely, the animal surviving till the eighth day—Davaine found that "carbolic acid when present in the proportion of 1 per cent. or more, destroyed the virulence of the liquid"; the germicide being allowed from thirty minutes to an hour to exert its action. On the virus of glanders Dr. Baxter found carbolic acid effective in one experiment in which it was present in the mixed liquid in the proportion of 2 per cent. Another experiment with the germicide in the proportion of ·5 per cent., terminated in the death of the animal (p. 245). As with sulphurous acid so with carbolic, Dr. Baxter found a weaker solution effective against septic microzymes, its presence in the proportion of 1 per cent. completely depriving them of reproductive power (p. 250). At the conclusion of his report he states, that "no virulent liquid can be considered disinfected by carbolic acid, unless it contains at least 2 per cent. by weight of the pure acid" (p. 255).

Five observations of my own give the following results. In one all the insertions, three being with pure lymph, failed—the lymph probably being bad; of the remaining four, one was with a 1 in 20 carbolic solution, and three with a 1 in 10 solution, mixed in equal proportion with lymph immediately before use, and in all the lymph was barren.

Experiments by Dr. Dougal with carbolic acid tend to throw some doubt on its value as a germicide. He found vaccine which had been exposed thirty-six hours to the action of the

concentrated vapour effective in producing perfect vesicles (*Glasgow Med. Journ.* 1872, p. 165). With a mixture of two tubes of vaccine and one minim of a 1 in 50 solution, after it had been kept ten days, he vaccinated successfully. The disinfectant present here being certainly under 2 per cent., the result corresponds with those obtained by Dr. Baxter. In another publication (*British Med. Journ.* 1879, vol. ii. 726) Dr. Dougal presents us with a very surprising result which he obtained. He "mechanically incorporated about forty parts of carbolic acid with about sixty parts of fluid vaccine, and found that this mixture, after being kept from the air for two days, failed to vaccinate; while a portion of the same preparation, after being freely exposed to the air for twelve days, succeeded in vaccinating. These experiments were repeated with the same results." "It was found also that no amount of exposure retrieved the lost infecting power of the lymph, which had been exposed to the other acid fumes until it was acid."[1] His observations, he says, warranted him in concluding "that carbolic acid was not a disinfectant, not a destroyer of organic matter, but rather an antiseptic, or preserver of organic matter, arresting and preventing putrescent and fermenting change, and suspending zymotic action for a time proportioned to the quantities of the acid and organic matter mixed, but latterly becoming volatilised, and leaving such matter, whether infective or otherwise, in its original state." This observation is so surprising, that I have thought it desirable to repeat the experiment. I prepared four specimens mixed in the same proportions as Dr. Dougal employed, namely, two parts of fluid carbolic acid with three of vaccine, and while mixing them could not resist the thought that it would be a most extraordinary thing if this lymph were not destroyed. The mixture was exposed to the air on glass slides for fourteen days, and then moistened with water and preserved in glass tubes, and used either the same day or within a very few days. In each of the four experiments the lymph was entirely barren. Two experiments were made with a mixture of

[1] Carbolic acid has not this power of rendering infective matter acid. Dr. Dougal holds that seeing all infective matters are alkaline, as vaccine, variola, virus of infective inflammation, glanders, enteric and choleraic fæcal matter, it is natural to expect that acids should disinfect.

equal parts of vaccine and a 1 to 10 carbolic solution, exposed to the air for fourteen days, in one of which the lymph was barren, and in the other produced an imperfect vesicle. One more experiment, and the only one which appeared to lend any support to Dr. Dougal's result, was with equal parts of vaccine and glycerine of carbolic acid, and this specimen, after fourteen days' exposure, yielded a good vesicle; but one must bear in mind the possibility of some pure lymph being by some inadvertence rubbed off one of the other points of insertion, perhaps by an accidental movement of the child's arm against clothes before the lymph was dry.

These experiments with carbolic acid must be considered sufficient to prove that the vapour is not a sufficiently powerful disinfectant for practical purposes, seeing that exposure to air saturated with it for any time under thirty minutes entirely failed to impair the infectivity of vaccine, and that even thirty minutes' exposure was uncertain in its effect. It is, therefore, probably useless to vaporize carbolic acid in an infected sick room.

A $2\frac{1}{2}$ per cent. solution cannot be relied on to destroy vaccine immediately, but as the greatest interest of observations with carbolic solution is in connexion with surgical and obstetrical work, it is satisfactory to know that Dr. Baxter found a 1 per cent. solution effective in five minutes against infective inflammation, and Davaine the same against malignant pustule, so that we are almost certainly safe to conclude that washing the hands in a 5 per cent. solution for a few minutes will effectively protect our patient.

(*To be continued.*)

FOLLICULAR TONSILLITIS: ITS SYMPTOMS, CAUSES, AND TREATMENT.

BY F. P. ATKINSON, M.D.

I SUPPOSE every medical man has occasionally seen a mild case of follicular tonsillitis accompanied with slight feverish symptoms and general malaise, but it seldom occurs in its severer and epidemic form, and the consequence is, when it does break out, it is often supposed to be a species of diphtheria. I have looked into various text-books on medicine for a description of the disease, but have found it to be almost entirely passed over, and it is on this account I have ventured to make a few remarks on the subject.

Symptoms.—The patient complains of chilliness, followed by heat and dryness of skin, pain in the head and limbs, more especially the shoulders, and occasionally there is congestion of the eyes and nose, together with herpetic eruptions about the lips. The temperature is above the natural, often as high as 103°. The tongue is coated, and on the tonsils, which are somewhat red and swollen, are some small, round, slightly elevated buff-coloured patches. There is generally some pain in swallowing, but as a rule it is not very great.

Causes.—Not at present quite clear. Two theories have been put forward: one that it arises from taking milk drawn from cows suffering from foot-and-mouth disease, the other from damp associated with deficient sanitary house arrangements. In the early part of the epidemic which occurred in Surbiton and Kingston at the end of 1882 and the beginning of 1883 the weather was particularly damp and foggy, and *the sufferers were almost entirely women and servants. Rarely more than two or three in a house were attacked. Very few, if any, children were attacked under five years of age.* These facts struck every one, and were accounted for by the damp state of the basements of the houses, and the young children being generally kept in the upper parts. Mr. Shirtliff, the Medical Officer of

Health for Kingston, suggests that the disease may be simply pharyngeal herpes, modified by the situation. "Certainly," he says, "it coexists with labial herpes and the premonitory malaise of ordinary influenza. The early high temperature points to a catarrhal origin." Some persons in the district finding that a large proportion of cases occurred amongst those supplied by one particular dairy (which I may remark in passing was by far the largest and best managed in the place) asserted that milk was the cause, and that there was something wrong either with the cows, dairies, water, or *employés*. These were all thoroughly examined by the Medical Officer of Health, Sanitary Inspector, Inspector of Nuisances, &c., and persons were sent to inquire as to all possible chances of supply, but nothing wrong could be detected. Subsequently it was found that nearly every dairy in the place was more or less implicated, and this was supposed to be due to the purchase and admixture of milk from the originally suspected source. Of course the smaller milk purveyors, who were anxious to increase their business at the expense of the suspected dairy, readily jumped at and circulated this idea. However, one case which was said to have arisen in this way, I carefully inquired into. I learnt the day and the time when the milk was bought, and found out that the person affected had been served before the suspected milk was purchased. The dairyman, when questioned as to whether he had bought any milk on the day mentioned, admitted that he had, and without further inquiry the suspected milk was put down as the cause. Prior to this day and time the man had purchased no milk at all, as his supplies had not run short. Again some people were affected who took no milk or cream at all, and since it has been reported that some cats were badly ill from drinking the milk, I may state that one gentleman asserted that his dog who never tasted a drop of milk, had a bad mouth and throat, while the cat, which was always well supplied, had nothing whatever the matter with it. But supposing that cats were ill with the same complaint, if it were really a species of influenza—it is surely nothing astonishing, as they are generally the first in the house to be attacked. Considering that *out-breaks of foot-and-mouth disease have been prevalent through-out the country for several years past*, and that *this epidemic of*

follicular tonsillitis is something which *has arrested the attention from the rarity of its occurrence* in so widespread a form, it would certainly appear as if milk were not at any rate the sole, if it be one of the causes. A curious fact, worth noting, is that though the *cases* that came under my care were *ordered larger quantities of the milk than usual* they almost all, with scarcely a single exception, were *convalescent in three days.* Some had subsequent debility, but this arises occasionally after attacks of influenza.

If follicular tonsillitis and foot-and-mouth disease be really one and the same disease, it certainly runs a very different course in human beings and cattle. In the former its *average duration is from three to four days*; whereas *in cattle,* I believe, it is rather *a trying and lengthy illness,* and causes great loss of flesh in almost every single instance. It is moreover infectious in cattle, and apparently non-infectious in man.

The milk contractor of the Lincoln Union it would appear was, in the beginning of 1883, fined for not reporting that he had foot-and-mouth disease amongst his cattle. There was not then, nor had there been, any special illness amongst the inmates, and he asserted that he had not supplied milk from the infected cows, but it is difficult to suppose that no milk was forwarded during the time they were sickening and before the symptoms distinctly showed themselves. Since the epidemic of 1882-83 I have seen occasional cases of follicular tonsillitis, both in this and other places, and Mr. Shirtliff says that during the winter months scarcely a week passes without his seeing two or three fresh cases. Such being the facts, I cannot myself see how we can come to the conclusion that foot-and-mouth disease and follicular tonsillitis are one and the same disease.

Treatment.—I generally found a mixture consisting of effervescing citrate of potash, with chlorate of potash, or biborate of soda, and sweet spirits of nitre taken every four hours, and

A gargle, consisting of

30 grains of boracic acid;
2 drachms of glycerine; and
1 oz. of the compound infusion of roses,

to afford distinct relief. The diet should be light and nourishing, viz., corn flour, milk, and beef-tea.

Reviews.

Hospital Construction and Management. By F. J. MOUAT, M.D., F.R.C.S., &c., and H. SAXON SNELL, F.R.I.B.A. Part II. 4to. London: J. and A. Churchill and Co. 1884.

BY far the greater part of this volume consists of a continuation of the detailed descriptions of the more important European and other hospitals, commenced in Part I. These descriptions are, as a rule, given with much minuteness, and many of them are beautifully illustrated by plans, elevations, and sections. Whilst it is to be regretted that the volume is so much restricted to mere descriptive matter, it must be owned that even from this point of view it has considerable value. Nowhere else could we turn, for example, for the complete details as to the construction of the Lariboisière Hospital, the Hôtel Dieu, the Tenore Hospital, the Johns Hopkins at Baltimore, or of many other celebrated institutions of the same sort, and hence, if for purposes of reference only, the volume forms a very material and important addition to hospital literature. So also, having regard to the manner in which it has been compiled, it must be considered as by no means costly to the purchaser. In addition to hospitals actually erected, details and plans are given showing certain important proposals which have been made as regards hospital construction, and in this connexion the scheme advocated by Dr. Burdon Sanderson for destroying by fire all the air passing out of a small-pox hospital is reproduced. The volume concludes by a section in which Dr. Mouat has dealt with the question of the organisation of medical relief in the metropolis. Dr. Mouat's views on this subject have already, to a considerable extent, been made public. He would have all hospitals, whether poor-law institutions or general hospitals, open to all who, when sick, are unable to contribute towards their own maintenance and relief; he would not allow mere sickness to subject any one to the penal consequences of the poor-law; and he strongly advocates the appointment of a Royal Commission to

enquire into the whole subject. The information which he gives goes to prove that the present system exhibits numerous defects, and that both in connexion with the need for a better distribution of the hospital accommodation of London, and otherwise, public enquiry is needed [Cf. *Practitioner,* xxxi. 124].

Post-nasal Catarrh and Diseases of the Nose causing Deafness. By EDWARD WOAKES, M.D. Lond., Senior Aural Surgeon and Lecturer on Diseases of the Ear, London Hospital, &c. Cr. 8vo, pp. 212. London: H. K. Lewis. 1884. (Being Vol. I. of the third edition of *Deafness, Giddiness, and Noises in the Head.*)

THE author of this little volume has given to post-nasal catarrh an importance which it has not hitherto received in this country. Indeed he draws a very grave picture of the disease as commencing in a violent inflammation of all parts of the throat and naso-pharynx and terminating in a general hypertrophy—or, worse still, atrophy—of the affected parts, and confirmed deafness. The treatment of the chronic conditions of post-nasal catarrh is prolonged and not without considerable inconvenience to the patient: the first stage of treatment is to last from three to six weeks or perhaps much longer, the second stage may be as long, and even then we are not told that the patient can be promised with fair probability that he will be cured. More than this, the diagnosis and treatment are of such a kind that they can be carried out efficiently only by a well-trained specialist; for, unless our methods of posterior rhinoscopy are very much altered or improved, posterior rhinoscopy and the operations which are performed with its assistance will always remain the property of a very few persons.

We can, however, scarcely believe that Dr. Woakes wishes us to infer that the more usual or frequent course of post-nasal catarrh is such as he depicts. In our experience post-nasal catarrh is a common disease in this country and attacks persons in all grades of life, producing, as its only or worst effects, a little dryness at the back of the throat, a little hawking, especially in the morning, and a slight impairment of the hearing. Persons remain in this condition for many years; sometimes they consult a medical man, but the disease produces so little inconvenience that, if the prescribed treatment is inconvenient or disagreeable, they speedily neglect to carry it out. We can scarcely suppose that such patients as these would submit to the long and tedious treatment by a specialist which Dr. Woakes suggests.

We think the book would have been even more valuable to medical men who are not specialists in throat or ear diseases if the author had devoted more space to the consideration of the

diagnosis and treatment of the early stages of post-nasal catarrh, whether acute or chronic. The most useful chapter to the family attendant is that on the "Management of the Catarrhally Predisposed." The necessary space for other similar chapters might have been gained without unduly enlarging the book by compressing the pages which are devoted to the "Etiology of Catarrh." The author's theories are somewhat vague and are not always supported by clear proofs. On this account, perhaps, he has found it necessary to expend more time and space on them than they would otherwise have needed. It is unfortunate that the punctuation in many instances makes harder still what is already not easy reading. Take these sentences as examples:—"Long-continued management on the lines already indicated, may be required to prevent subsequent irruptions of the catarrhal proclivity" (p. 130); "It thus comes to pass that though in a tissue area comprising many complicated organisations quite distinct from each other all of which are supplied with branches of the same artery, yet is each differentiated as regards impressions affecting its individual blood-supply, from contiguous but histologically distinct structures, by the special corpuscular connections of the nervi-vasorum of each in the ganglionic centre" (p. 127).

We hope, when another edition of this volume appears that the author will correct these faults of presentation and make the book more useful to the general medical practitioner. We have no doubt it will then become as popular as the work of which it forms a part of the third remodelled edition.

Clinic of the Month.

Extirpation of Goitre by means of the Elastic Ligature.—Dr. G. Usiglio reports the case of a patient, æt. 56, who had enlargement of the thyroid body due to hyperplasia of the left lobe, in which the enlargement was removed by means of the elastic ligature. The part came away in five days, and the patient recovered easily. Two months previously, in March 1883, Dr. G. B. Masta had successfully employed the same means for the removal of a pedunculated tumour. De Vecchi and Castelleone have also reported cases. An incision is made in the skin, in which the ligature is placed, the wound being disinfected and the ligature tightened daily. (*Gazzetta degli Ospitali*, Jan. 16, 1884.)

Diphtherial Arthritis.—In an epidemic of diphtheria occurring in a school, Dr. Pauli observed some cases of multiple joint disease existing as a complication. He explains the occurrence of this arthritis as due to the specific virus acting in the same way as in that of gonorrhœa, pyæmia, &c. (*Centralblatt für klinische Medecin*, May 10, 1884.)

Local Temperature in Biliary Colic.—Dr. Jules Cyr calls attention to the diagnostic value of local thermometry during the attack, in a monograph that has recently appeared (*Traité sur l'Affection calculeuse*, Paris 1884). If, during the paroxysm, the thermometer be applied to the area of greatest pain, there is observed a local rise of a quarter, half, or even one degree centigrade above the normal temperature of the region. This local rise may, indeed, reach the level of the axillary temperature, which, under normal circumstances, is a degree and a-half higher than that of the epigastrium or the right hypochondrium. This fact was first brought to the notice of the profession by Professor Peter, at La Charité, in whose service the author had, in March 1883, the opportunity of observing an interesting case, of which the following particulars are stated. A young woman, confined for two or three years to bed by disease of the spine, was seized during her sojourn in the hospital, and at the end of the second year of decubitus,

with a paroxysm of biliary colic, which was speedily followed by others of a like kind, one of which was attended by jaundice. The trace which displayed the axillary temperature, that of the left hypochondrium, and that of the right hypochondrium, during a period of three months, demonstrated—1, a constant parallelism between the elevation of the axillary temperature and the elevation of that of the right hypochondrium; 2, in the periods in which the attacks of biliary colic were absent, the tendency to a uniform temperature in the two hypochondriac regions, sometimes without appreciable difference, sometimes with a variation of a quarter or a half-degree C.; 3, during the paroxysms, the temperature of the right hypochondrium was higher than that of the left to the extent of 1° to 1°·3 C. It sometimes attained, and on one occasion even exceeded, that of the axilla. In a second case, where the focus of pain was in the epigastrium, the temperature at this point, which had been 36°·1, rose to 37°·8 and 37°·9, while the axillary temperature varied between 36°·6 and 37°·5. In a third case, characterised by violent and frequent almost quotidian paroxysms, the temperature of the right hypochondrium almost always exceeded that of the axilla of the same side. This element of symptomatology, heretofore overlooked, M. Cyr has, on several occasions, studied, with the result of fully confirming the observations of Professor Peter. He has, further, found the difficulties attending the application of the surface thermometer, under the circumstances, less serious than he was at first led to expect that they would prove. Pain constitutes the essential element of the paroxysm of biliary colic. Other phenomena accompanying it are accessory, and may all be absent in particular cases, for their presence is dependent upon circumstances not at all necessary to the paroxysm. To this general statement, however, it appears that an exception may now be made in favour of the local elevation of temperature. This, in the absence of any cause beyond the paroxysm adequate to explain it, constitutes an important element of diagnosis, especially when we consider that in gastralgia and intercostal neuralgia—maladies in many respects closely resembling the attack of hepatic colic—local elevation of temperature does not occur. (*Philadelphia Med. Times*, May 31, 1884.)

Hæmaturia and Renal Cancer in Children.—One case of this affection is recorded in detail by Dr. Seibert of New York. The fifty cases which are recorded in the literature of the subject are tabulated by him. From this table it appears that the disease is more frequent in infants than in children of greater age. He gives to A. Jacobi the credit of

first observing that this disease may be developed *in utero*, (Jacobi's case was presented to the New York Obstetrical Society, October 7, 1879,) and quotes the same author's opinion that cases in infants, which are diagnosticated as *tabes mesenterica*, are in some instances cases of malignant abdominal tumour. As to symptoms, the presence of a swelling is usually the first one which is observed. With it, or soon after it, come emaciation, pain, and obstinate vomiting. Hæmaturia is relatively more frequent than in the same disease in adults, and is more frequently met during the third, fourth, and fifth years. The same symptom is more common early rather than late in the disease; in fact, in two-thirds of the tabulated cases, it was the first symptom which was observed. It comes suddenly and unexpectedly, and usually in abundance. Further, in regard to this important symptom, especially as a means of differential diagnosis, the author distinguishes four classes of cases. (1) Those in which it occurs in children previously regarded as healthy, (*a*) without premonitory pains, (*b*) with premonitory pains. In all such cases there is the possibility that it may proceed from stone in the kidney, or from a kidney which has undergone cheesy degeneration; but either condition is less probable than the one from which it is to be differentiated. (2) Cases in which emaciation has existed for a long time before hæmaturia supervenes. This is also an infrequent condition when cancer is present, the emaciation usually following the discovery of the tumour. (3) Hæmorrhage, in connexion with cancerous degeneration of the kidney, may be associated with an acute febrile process which is referable to that organ. (4) Cases in which hæmorrhage from the kidneys occurs in the course of a chronic inflammatory process in the renal tissue. The hæmorrhage is apt to be repeated several times, at intervals of varying duration, but it not often is, *per se*, the cause of death. (*Jahrbuch f. Kinderheilkunde* 3, vol. xxi.; *Arch. of Pediatrics*, May 1884.)

Pepsin and the Peptones in the Treatment of Diabetes.—Professor D. Giovanni (*Gazz. Med. Ital. (Provincia Venete)*, January 12, 1884) draws attention to the frequent utility of pepsin and peptones in the treatment of diabetes. He cites the following case. A young man, aged twenty, was admitted, and gradually submitted to an exclusively meat diet with lactic acid. Even when all milk, starchy and saccharine matter, were entirely omitted, the urine was as abundant as before, and the quantity of sugar the same, and the patient did not become stronger. The thought occurred to Dr. Giovanni that all the meat and eggs taken were not utilised in the organism. The bodily strength was not in proportion to the energy-

value of the food, neither was the quantity of urea in the urine. The examination of the fæces showed a large quantity of meat unaltered and scarcely masticated. The patient was then placed on ordinary diet, but with a certain quantity of pepsin and peptones, prepared according to the method of Professor Lussana. (The stomach of a calf is cut in pieces, and placed in a quart of dry white wine; after eight days filtered; the filtrate contains pepsin and peptones.) The patient quickly began to improve in general nutrition, and was able to get up; the quantity of sugar and of urine was lessened. On returning to the meat diet the patient again became worse, and was again better on the substitution of the mixed diet with pepsin and peptones. Continuing this diet, he so far recovered as to be able to leave the hospital, and a year afterwards, though diabetic still, was in fair health. Professor Giovanni has found equal benefit in other cases from the same treatment, but not in all. He concludes that pepsin and the peptones (Lussana) constitute an element useful in completing the diet of the diabetic, when defective gastric function helps to exaggerate the effects of the disease on the general health. (*London Medical Record*, March 1884.)

Internal Use of Chrysophanic Acid.—Dr. Stocquart reports sixty-one cases treated by internal administration of chrysophanic acid (*Annales de Derm. et de Syph.*, Jan. 1884). No form of local treatment was employed. Of the sixty-one cases, fifty-six were entirely cured, and only one was unaffected by the treatment. The cases of acne, ecthyma, and impetigo, all yielded rapidly to the treatment, except one case of papulous acne. One case of pityriasis and three of urticaria were also quickly cured. In four cases of lichen and four of prurigo, the irritation was rapidly diminished, in lichen disappearing before the complete cessation of the eruption. Of thirty-two cases of eczema, thirty were cured. The author was much struck with the rapid and complete cure of acute eczema and of impetiginous eczema in children. Out of five cases of psoriasis, three were cured. The acid was generally administered in water, the bottle being well shaken before use. In ordinary doses no patient objected to it; it was also prescribed in pills. The medium dose is one centigramme a day for children, and three centigrammes for adults. In these doses it is generally well tolerated; in larger doses it may cause loss of appetite, nausea, palpitation, with præcordial distress and constriction of epigastrium, giddiness, vomiting, and cold shivers. This is an occasional occurrence only, and often much larger doses are well borne. Children tolerate the medicine well; at four weeks, he has given one, two, and in one case five centigrammes without provoking gastric irritation. Where the eruption is limited to

parts ordinarily covered, and when the skin is not very thin or delicate, the external use of chrysophanic acid as ointment is indicated. Where a great extent of surface is involved, the internal use is better. Phenomena of local irritation, or erysipelas, or gastro-enteric symptoms, or nephritis, may be caused by the too free external use of the acid. Its internal use is also indicated when the eruption affects the hands or face. Where the stomach will not bear the remedy, it may be given hypodermically, but is then apt to cause pain and abscess. Its action is more rapid than when given by the mouth. [*Pract.* xxix. 132] (*London Medical Record*, June 1884.)

Case of Addison's Disease.—Giuseppe Ceccato, aged twenty-five, with good history, a year and a half before his death noticed that his skin was becoming brown. He began to feel an unwonted weakness, suffered often from giddiness and headache, with loss of appetite, and at times from slight attacks of fever. He was admitted in June 1882, and on July 9 following was discharged much better. During the time he was in the hospital, in the first four days his temperature oscillated between 38° and 39°·2 C. On December 4, 1882, he was again admitted at 11.30 A.M. He was then shivering violently, was perfectly conscious, and the temperature 39° C. A little later the shivering ceased, and the patient was tranquil until 2 P.M., when he became suddenly delirious (gay and lascivious). This was followed by tonic convulsions and involuntary emission of urine. The pupils were widely dilated, and little, if at all, acting to light. This convulsive state lasted to the evening. At 2 A.M. he died. The results of the necropsy are given in great detail. Briefly they consisted of (1) complete destruction of the suprarenal capsules, which were substituted by chronic inflammatory products, in great part caseified and calcified; (2) engorgement of the lymphatic and agminated follicles of the intestinal mucous membrane; (3) deposit of yellow or black pigment in different organs, especially in the mucous tissue of the mouth and in the cutis. In the mucous membrane of the mouth and in the cutis, besides the pigmental deposit, there was infiltration of the superficial layers of the dermis with small cells. There was no lesion of the ganglia or sympathetic nerves, and, more than this, the sympathetic nerves remained perfectly normal in the midst of the chronic inflammatory products which destroyed the suprarenal capsules. Elaborate search was made for bacilli (30 or 40 sections a day for a month were examined by all the different methods of coloration), but without success. The author mentions that under certain conditions he found that the little globules of fat became coloured just like Koch's bacilli when Weigert's process was used. The semilunar

ganglia and solar plexus, cervical and lumbar ganglia, were all found to be perfectly normal. The branches of the sympathetic nerve were also free from any alteration. This case clearly shows that Addison's disease may depend on diseases of the suprarenal capsules without alterations of the sympathetic. (*Gazz. Med. Ital.* (*Provincia Venete*), April 12, 1884; *London Medical Record.*)

The Classification of Cirrhosis of the Liver.—Dr. Saundby showed, at a meeting of the Midland Counties Branch of the British Medical Association, a microscopic specimen from a case of hypertrophic cirrhosis of the liver, in which numerous newly-formed biliary canaliculi could be seen naturally injected by inspissated bile. In this case, which had been under observation from its commencement, there had never been any jaundice; ascites was present in moderate amount; and the liver, which at one time nearly filled the abdomen, was much enlarged at the time of death. The surface of the organ was smooth, and, on section, the liver-tissue was stained yellow, and surrounded by tracts of grey fibrous tissue. The arrangement of the fibrous new growth was multilobular and interlobular; but the liver-cells were proliferating and fatty, and there were numerous biliary canaliculi round the margins of the acini. This case illustrated the inexactness of the views of the French school, which attempted to divide cirrhosis into two types—common and biliary cirrhosis—in which the latter form was characterised, clinically, by enlargement of the liver, early jaundice, and absence of ascites; and, histologically, by the new growth being unilobular and intralobular, the liver-cells proliferating, and, most of all, by the numerous newly-formed biliary canaliculi. This case conformed in all respects to the type of common cirrhosis, with the exception that the liver was enlarged, that the liver-cells were proliferating, and the biliary canaliculi were numerous. It therefore shared the characters of both the so-called types, which were creatures of the imagination, not pathological realities. (*Birmingham Medical Review*, July 1884.)

Pomegranate-root for Tape-worm.—Dr. Charles Forbes writes from Moriani, Upper Assam: Three cases in my experience present the following points in common. In all the worm was solitary and a *Tænia solium.* All three were long-standing cases, in which male fern (as well as kousso, kamala, and turpentine) had been repeatedly unsuccessful. I may here add that in these cases male fern, when first used, brought away large quantities of the worm but failed to expel the head, and that the worm seemed to acquire a tolerance of this drug in time. The effect of the pomegranate-root bark was identical in all,

both as regards the patient and the worm. The mode in which the worm was expelled was also precisely similar in the three cases. The first and third cases were Europeans who had been passing joints for about eighteen months. The second case was a Bengalee coolie woman who had suffered for the past five years. The points of similarity being such, one case only need be cited. I take the first case as being typical. S. S. N., tea planter. Treatment by pomegranate-root bark. Took a light breakfast at 12 noon and went to bed without any dinner. At 6 A.M. next morning took half ounce of castor-oil, and at 7 A.M. one ounce of the fluid extract of pomegranate-root bark. This was ejected about ten minutes after, and a second dose was administered, which was retained. About half-an-hour after the tape-worm was expelled, head first, in a complicated knot, and entire. The animal was not dead, but seemed rather to be intoxicated, and the patient described his sensations to be of the same character. A third dose was then administered, on the chance of there being a second worm, but without effect. In this and the other two cases, the head of the worm under the microscope proved to be that of *Tænia solium*. The following are the points I consider worthy of note:—(1) The superiority of the pomegranate over the male fern. (2) The primary emesis and subsequent tolerance. In this respect pomegranate resembles ipecacuanha. (3) The intoxicant effect. Dr. Forbes adds that the drug should be freshly prepared. (*Glasgow Med. Journal*, July 1884.)

Hæmorrhage following Scarification of the Cervix.—Dr. A. Muratoff relates a case in which he scarified the cervix uteri, making three incisions on either side of the external os. As the operation was well borne and seemed to answer the indications in the case, he repeated it a second and a third time. A short time after the last scarification the woman was seized with so severe a hæmorrhage that it was found necessary to pass a suture through each of the incisions in order to control it. The author concludes from this experience that scarification of the cervix uteri is not so trivial an operation as is usually supposed, and he warns his readers not to lose sight of the patient until some hours have elapsed and it is certain that no more bleeding will occur. (*Deutsche Medizinal-Zeitung*, May 12, 1884; *New York Med. Record.*)

Febrile Lassitude.—Under this title (*courbature fébrile*) Dr. C. Eloy describes a condition characterised by a moderate degree of pyrexia, some gastric disturbance, and extreme lassitude, with a bruised feeling in the muscles. There is almost constant headache with pains in the legs and lumbar region. The fever is moderate, seldom more than two or three

degrees above the normal, and usually presents an evening exacerbation. The digestive disturbances are slight. The abdomen is soft and painless, and without any eruption. Constipation is the rule. The fever subsides in three or four days, but the headache and anorexia remain for a few days longer. The cause of this condition is found in excessive fatigue following prolonged muscular exertion. It also results from exposure to extreme cold or heat. Violent emotion or a severe mental shock may cause similar phenomena. It is perhaps due to disturbances in trophic innervation, and occurs with greatest frequency at the two extremes of life, when the nutritive processes are either very active or very sluggish. It may at the outset be mistaken for a commencing typhoid fever, but a short time suffices to clear up the diagnosis. It may be distinguished from a bilious attack by the condition of the tongue which in the latter is heavily coated, while in *courbature* it is usually clean. The treatment consists in rest and the exhibition of quinine in small repeated doses. The feeling of extreme weakness is best relieved by coca or alcohol in some form. (*L'Union Médicale,* May 24, 1884.)

Removal of the Ovaries for Pelvic Disease.—The indications for the operation of castration in the female are discussed by Müller, and are classified as follows:—(1) Uterine fibroma with hæmorrhage; (2) intense dysmenorrhœa with enlarged uterus; (3) ovarian disease. Six cases are related in which the operation was performed for uterine fibroma. In one the ovaries could not be found, and so the operation was obliged to be abandoned, and in another the patient died of peritonitis. Of the remaining four one was scarcely improved at all, but the bleeding was much diminished: the other three were relieved of all symptoms, and the tumours grew gradually smaller. The indications for such an operation appear to be the presence of the tumour accompanied by such an amount of hæmorrhage and discomfort as to endanger the patient's life, provided all such medical treatment as injection of ergotin, etc., has failed to give relief. Two cases of intense dysmenorrhœa with enlarged uterus are referred to, in both of which after operation considerable relief was experienced, and in one a complete cure was the result. Eleven cases of ovarian disease are referred to in which apparently solid tumours were present, and the organ was more or less adherent to the surrounding parts. Seven of these were successfully operated on and recovered, but only two could be said to be completely cured. In four cases it was impossible to remove the ovaries. (*Deutsche Zeitschrift f. Chirurgie,* 1 and 2, xx.)

Extracts from British and Foreign Journals.

Renal Syphilis.—In an inaugural thesis by Dr. Negell, we find the following *résumé* on the subject of renal syphilis:—1. Syphilis, in any of its stages, may affect the kidneys; the same is true of hereditary syphilis, in infantile or adult life. 2. Certain renal complications are precocious, others late. The first, only studied within the last few years, manifest themselves in the first months after infection with all the characteristics of the nephritis of the infectious fevers; when the *début* of the chancre dates back several months, the clinical history of the renal affection is similar to cases of glomerulo-nephritis which are seen in scarlatina, for example. 3. Syphilitic nephritides occurring in the secondary stage are always grave accidents; nevertheless they are curable, not only in the acquired syphilis of adults, but also in the hereditary syphilis of childhood. Their gravity appears to bear a certain relation to the age of the syphilis and the time which the patients have been subjected to specific treatment. 4. Albuminuria being the principal symptom in the examination of these renal accidents, we understand how specific nephritis may pass from view before the other secondary accidents of syphilis. 5. When œdema appears and is sufficiently marked to attract the attention of the patient and physician, another cause is generally assigned to it, so that syphilis is readily eliminated from the diagnosis. 6. These albuminuric patients being improved under the influence of specific treatment, and taking no further care of themselves after the secondary accidents have disappeared, the renal lesion may slowly pursue its course, and when, later, the patient comes under the care of the physician, it is more than probable that his suspicions will be directed to another cause than syphilis, especially since it so often happens that the patient declines to confess to a disease which he has every interest in concealing. It is necessary, then, when a patient comes under the physician's care with all the symptoms of an acute or chronic nephritis and the etiology generally adopted proves doubtful, to think of syphilis and institute a specific treatment. If the patient bears any traces of syphilis (either upon the organs appreciable to

view, or in the viscera, nervous centres, liver, &c.), these accidents only confirm the diagnosis of a syphilitic renal lesion. 7. Precocious syphilitic albuminuria is generally persistent and of quite long duration. There remains a question of extreme importance to be resolved: what will be the outcome, in a time more or less remote, of the secondary syphilitic nephritides considered as cured? The presumption is probable that a certain number of cases of Bright's disease may be the recurrence or latent termination of this primary disease of the kidneys (precocious syphilitic nephritis). 8. Specific treatment gives the same results as in the other precocious accidents of syphilis. Milk diet should be regarded as a simple adjuvant but not recognised as a necessity. 9. Renal complications occurring in an advanced stage of syphilis (tertiary and quarternary accidents) exist, presenting sometimes the character of acute or chronic Bright's disease, sometimes the characters of amyloid degeneration; in the last case, contrary to the opinion generally held, we think with Wagner that the amyloid kidney is a consequence of syphilis, and not of a concomitant suppuration or of a mercurial or venereal cachexia, for cases occur in which there is no suppuration, and the patients, far from being cachectic, are on the contrary quite vigorous. 10. These specific renal alterations are more grave than those which appear in the first years of syphilis. Nevertheless they may be benefited by specific treatment, the sole condition being that the renal lesion be not too far advanced; for, as in the case of the nerve-centres, we cannot rebuild the tissues. 11. Gummata of the kidneys, although quite rare, exist; but no pathognomonic symptom reveals their presence during the life of the patient. It is probable that antisyphilitic treatment would have the same results as in gumma of other viscera. (*Journ. of Cutaneous and Venereal Diseases*, May 1884.)

Nitrite of Amyl for Ammoniacal Urine.—Professor von Dittel observed at the Vienna Medical Society that he had for a long time past, in obstinate cases of ammoniacal urine, found this substance very useful. A solution is made of three drops in 150 of water, and a tablespoonful of this is added to a litre of water, with which the bladder is washed out. The unpleasant smell of the urine diminishes immediately, and is replaced by a pleasant ethereal odour. (*Allgemeine Wiener medicinische Zeitung*, Jan, 15, 1884; and *Med. Times*.)

Affections of the Eye-muscles in Diseases of the Brain and Spinal Cord.—Disturbance in the function of the eye-muscles is observed in many forms of brain disease. This condition, as pointed out by Dr. Henry G. Cornwell, is brought about by intra-cranial diseases, which affect the innervation of one or

all of the three motor nerves distributed to the eye, *viz.*, the third, or *motor oculi*, which supplies the levator palpebrarum and all the muscles of the globe of the eye except the superior oblique and the external rectus ; the fourth, or *patheticus*, which supplies the superior oblique ; and the sixth, or *abducens*, which supplies the external rectus. The *facialis* is also to be included in the group of motor eye-nerves, as some of its filaments are distributed to the orbicularis palpebrarum. Tonic spasm may affect the eye-muscles in some intra-cranial conditions, giving rise to strabismus. This is occasionally observed in the first or irritative stage of acute inflammatory affections of the brain, as, for example, in basilar meningitis. It may also be seen in epilepsy, at times in hysterical convulsions, and also in the convulsions of infancy due to teething, worms, etc. This form of spasm, in the greater number of instances, affects the internal rectus, the irritation giving rise to it being doubtless at the root of the third nerve in the floor of the fourth ventricle. The pupils are in most instances contracted, proving that the squint is the result of nerve irritation. *Clonic* spasm of the eye-muscles is a rare condition, which is seen in some cases of brain tumours, cerebral sclerosis, and tuberculous meningitis. Strabismus, on the other hand, may be the result of paralysis of one of the recti muscles due to a disturbance in the innervation of the nerves supplying them. Instead of a complete paralysis of an eye-muscle due to the intra-cranial disease, there may be only a paresis of the muscle, no deviation in its relation with its fellow being noticeable to an observer, further than, in marked cases, a halting or jerking in the movements of the eye towards the affected side. The subjective symptom of this condition is diplopia, or double vision, the distances of the images from each other being dependent upon the extent to which the affected muscle is enfeebled, and also upon the direction in which the eyes are turned. Paralysis or paresis of the eye-muscles, Dr. Cornwell points out, may be periodical in character, as has been observed in some cases of basilar tuberculous meningitis, cerebral syphilis, tumours, abcesses of the brain, and in the early stages of tabes dorsalis. (*American Journal of the Medical Sciences*, April 1884.)

The Ætiology of Tuberculosis.—With a view to prove the exact relationship of tubercle to the bacilli with which it is associated further investigations have lately been carried on by Koch, and he lays down the following statements :—

The bacilli are always found in greatest abundance in those tissues where the tuberculous process is most active, whilst, when the caseous masses appear, the bacilli disappear, and assume a spore-like condition in which they cannot easily be stained, and are therefore easily overlooked. In all the slower tuberculous

processes, *e.g.* those which are observed in joints, the bacilli are only found in the giant cells, and often one bacillus only is present in each giant cell. These giant cells are produced from simple cells by the irritation of the bacillus. If the process is a very rapid one, it does not end in caseation, but in the shrivelling up of the cell, and injection of the neighbouring connective tissues.

In scrofulous lymphatic glands, and in joint and bone affections, if the bacilli are found at all they are very rare; this is also the case with lupoid affections. In some cases forty or fifty sections will reveal only one bacillus.

When these various tuberculous deposits were employed for injection purposes the same result was produced in animals of the same species and variety. Even the slightest variety in an animal gave a variety in the result; *e.g.* whilst the field mouse was very susceptible to inoculation, the white mouse was not.

Sometimes the same animal at different times showed a varying susceptibility, and this result Koch is inclined to ascribe not so much to variety in the infective material as to the resisting power of the individual. (*Mittheil. aus dem kaiserl. Gesundheitsamte*, vol. ii. Berlin 1884.)

The Treatment of Hepatitis and Hepatic Abscess.—After pointing out the difficulties in diagnosis of hepatic abscess, and how utterly erroneous are the descriptions given in the textbooks, Dr. Manson ("*China Customs' Medical Reports for* 1883") describes his operative treatment. An abscess in the liver, he argues, ought to be treated exactly as an abscess anywhere else would be. The object of the present communication is to show how a free opening may be made into a deep-seated abscess without the danger of profuse hæmorrhage or of setting up peritonitis, and without incurring many other risks that might well be urged against the operation. Having ascertained the presence and site of the abscess, Dr. Manson punctures with a large trocar and cannula; after withdrawing the trocar he passes down the cannula a long stilette, on which, by means of a small eye at the outer end and a piece of string, he has stretched a piece of perforated indiarubber tubing; whilst inserting this he withdraws the cannula, so that the rubber tube is grasped tightly by the tissues. On cutting the string which keeps this stretched, it tends to rebound towards the fixed end, *i.e.*, towards the abscess cavity; the stilette is next withdrawn, when the wound, both in the liver and the abdominal wall, will be found to be securely plugged by the tube. This can then be connected with a bottle to receive the discharge, which at first would be too great to be merely received into the dressings. The whole operation is done under antiseptic precautions, and one of its not least advantages

is that it can be done by a man single-handed. (*Med. Times*, May 17, 1884.)

Examination per Rectum in Coxitis.—This method of examination is recommended by Carin in inflammatory conditions of the hip-joint, as well as of the pelvic bones, as a means of especial value in the period of childhood. Either the dorsal or the knee-elbow position may be chosen, the most important structures in and about the pelvis being easily accessible to the examining finger. The author recommends, however, the dorsal position when the right hip-joint is diseased, and the knee-elbow position when the disease is in the left side. The examining finger should of course be well greased, and slowly introduced into the rectum. The disengaged hand may be placed upon the abdomen, and may assist the examining finger in confirming its discoveries. Several cases of acetabular disease have been diagnosticated by the author by this means. His conclusion is that all cases of coxitis should be investigated *per rectum*, but especially those in which resection is to be performed. (*Arch. f. Kinderkrank.* 3, 4, vol. v.; *Arch. of Pediatrics*, May 1884.)

Nitrate of Silver in Spinal Irritation.—Dr. Betz strongly recommends this as a means of relieving the attendant pain, whatever may be its primary cause. A solution of one part of nitrate of silver to 100 of alcohol is thoroughly applied twice a day not only to the painful parts, but also for some distance beyond these, and, when necessary, along the whole spinal column. The liquid penetrates quickly, and soon dries up, producing an agreeably cool sensation, and very seldom gives rise to any irritation of the skin. This painting of the parts will have to be continued for weeks, or even months, especially if there is any disease of the spine itself present. (*Memorabilien*, Jan. 1884.)

Milk Diet in the Treatment of Gastric Ulcer.—M. Debove has lately lifted up his voice against the common practice of putting patients with ulcer of the stomach upon an exclusively milk diet. He argues that the quantity of fluid required is so great that a dangerous dilatation of the stomach is produced, thereby leading to hæmorrhage, and cites one case of death so caused. His plan is to give about six drachms of beef powder with two and a half drachms of bicarbonate of sodium. This, he found, is passed directly into the intestine, undergoing no change and causing no irritation in the stomach. In addition about a quart of milk with saccharated lime is allowed each day. M. Debove states that this mode of treatment has given him great satisfaction in a number of cases. (*Gazette des Hôpitaux*, April 29, 1884.)

Resection of the Astragalus in Ankle-Joint Disease.—In an article of some length on this subject Dr. Robert sums up as follows:—(1) A sprain of the ankle is often followed by chronic osseous lesions which are very prone to become localised in the astragalus or at the articular surfaces of the astragalus and os calcis. (2) These lesions may remain for a long time limited to this part of the tarsus, but are often very intractable to treatment. Even *évidement*, scraping, and deep cauterisation may fail to remove all the diseased bone, and sometimes cause such an aggravation of the disease that amputation becomes imperative. (3) The removal of the astragalus is an operation which facilitates the exploration of the articular surfaces attacked by caries. Practised according to Vogt's method it is easy of execution, attended with but slight mortality, and leads to a permanent cure, with often the preservation of excellent joint motion. (4) As is the case in all resections, the removal of the astragalus should not be attempted when the patient is affected with pulmonary tuberculosis or is of an advanced age, or, finally, when the disease is very extensive. (*Archives générales de médecine*, May 1884.)

Convenient Method of Applying Cold in Fever.—Dr. Mundie records notes of two cases in which he had recourse to a method which obviated the difficulty of the use of a cold bath. A married woman was suffering from pyrexia complicated with erysipelas. The author placed his patient on a Hooper's bed filled with iced water, placing a single blanket between the patient and the bed. The result was that in six hours the temperature fell from 106° to 104° F., and the patient ultimately made a good recovery. (*British Medical Journal*, April 12, 1884.)

Cantharides in Incontinence of Urine.—Dr. Roche states that five drops of tincture of cantharides, three times a day, is a good remedy for children suffering from incontinence of urine. It renders the neck of the bladder sensitive, and the stimulus of the urine keeps the sphincter tonically closed till voluntarily overcome at the micturition time. In children, want of tonic contraction in the sphincter, and not excessive sensitiveness and spasmodic effort in the body of the bladder, is the most frequent cause of nocturnal enuresis. (*Lancet*, April 1884.)

A New Test for Atropia.—Hitherto no reliable chemical test appears to have been found for atropia. Mr. Gerrard, F.C.S., believes that the following procedure constitutes a test for atropia and other members of the group of mydriatic alkaloids —hyoscyamin, daturin, duboisin, and homatropin. To a small portion of atropia in a test tube add about 2 ccm. of a 5 per cent.

solution of mercuric chloride in 50 per cent. of alcohol, and warm gently. A precipitate will at once appear, and become brick-red in colour. Like most alkaloidal reactions, Mr. Gerrard finds there are certain conditions necessary for the success of the test. It does not answer in dilute solutions, neither does it turn out well if atropia be added to the mercury. Other alkaloids give for the most part a white precipitate. The brick-red precipitate is the characteristic feature, and appears to be chiefly composed of mercuric oxide. (*Lancet*, March 8, 1884.)

The Action of Caffein.—At the recent Medical Congress in Berlin, Dr. Riegel read a paper upon the therapeutic uses of preparations of caffein about which he had arrived at the following conclusions:—That caffein resembles digitalis in its heart-regulating power, increasing the force of the heart, slowing its action, and raising arterial pressure. It acts very rapidly and causes a marked increase in the flow of urine. The indications for its use are similar to those which govern the prescription of digitalis. Caffein is best administered in small and frequently repeated doses, and it differs from digitalis in its more rapid action and in not having any cumulative effect. There are cases in which caffein acts when digitalis has proved inefficient. Narcotics, and especially morphia, should not be administered at the same time as caffein. And, finally, caffein, particularly the soluble double salts of sodium and caffein, caffein natro-benzoate, natro-salicylate, natro-cinnamylate are generally better borne than digitalis; the last mentioned compound from its ready solubility being very suitable for hypodermic medication. (*Berl. klin. Wochenschr.*, May 12, 1884.)

Cold Water Treatment of Typhoid Fever.—Professor Heubner, of Leipzig, describes his mode of carrying out the hydrotherapy of typhoid fever. He uses baths, not only or even chiefly on account of the high temperature, but also for their reflex action on the vessels of the skin, for which purpose they must sometimes be lukewarm, or even warm. For young and robust patients he often orders cold baths, often lasting from fifteen to twenty minutes; but when the temperature is low, or the patient either a child or an aged individual, a warmer bath is necessary, followed, however, in all cases by cold affusion over the head and neck. He never disturbs his patients when asleep in order to give a bath. He concludes his article by recommending small doses of calomel to be given early in the illness, as in the form of corrosive sublimate, into which it is changed as it passes through the organism, it will act antiseptically on the materies morbi. (*Wiener, med. Blätter*, March 6 and 13, 1884.)

Absorbent Tow.—Signor Silvio Plevani, Director of the Hospital Frate Bene Fratelli, has just published (May 28th) in the *Gazzetta degli Ospitali* a paper on "The Economical Preparation of some Antiseptic Dressings." He states that tow, which is a very cheap residual material, can be used for all surgical purposes instead of absorbent cotton, when prepared according to the following directions:—Boil the tow for some time in lye made with wood ashes, or with a ten per cent. solution of carbonate of sodium; then wash it repeatedly in water. The tow thus deprived of grease is immersed in a ten per cent. solution of chloride of lime, and kept in it some hours, with occasional stirring, until it has become perfectly white. It is then washed thoroughly in pure water until the liquid squeezed from it is perfectly limpid; drying and carding complete the process. (*Lancet*, June 7, 1884.)

Camphor Inhalations in Coryza.—Dr. G. E. Dobson writes—: "This very troublesome complaint has scarcely received the attention it deserves, if we take into consideration the great number of sufferers and the serious laryngeal and pulmonary diseases to which it is too often a prelude. Amongst the host of remedies proposed for its abortive treatment, most of which are either of doubtful value or else difficult to procure or apply, or even dangerous to use, not one can be named of which it may be said that it is at every one's command, easy of application, unattended with danger, and really effective. No excuse is, therefore, needed in introducing to the notice of the profession the following simple yet thoroughly effective mode of treatment. which in my hands has never disappointed expectation. About a drachm of camphor, coarsely powdered, or shredded with a knife, is placed in an ordinary shaving jug, which is then half filled with boiling water. The patient, having made a paper cone (out of a sheet of brown paper or an old newspaper) large enough to surround his face by its wide extremity and the mouth of the jug by its narrow end, proceeds to respire freely, at each inhalation drawing the steam into his nostrils, and at each exhalation forcing it up against the outer surface of his nose and adjoining parts of the face. A twofold action is produced: the camphorated steam acts internally in a specific manner upon the whole extent of the mucous surfaces, and externally, produces profuse diaphoresis of the skin covering the nose and sides of the face, there acting as a derivative from the inflamed Schneiderian membrane. The jug should be surrounded by a woollen cloth in order to prevent the water cooling, or, better, if a tin shaving-can be used, a small spirit lamp or heated iron may be placed beneath it, so as to maintain the heat of the water and the vaporisation of the camphor. The patient should continue his

respirations (keeping the margins of the base of the paper cone closely applied round his face) from ten to twenty minutes, and this should be repeated three or four times in as many hours, till entire freedom from pain is experienced. Great relief is always felt even after the first application, and three or four usually effect a cure. Camphor, or some of its preparations, have, as is well known, been long in use in the treatment of colds, but the above-described method of employing it in conjunction with the vapour of water both as an internal and external application at the same time, has not, so far as I know, been previously brought to the notice of the profession, or if brought, has not been recognised in any general or special medical work. The mode of application is, however, all important ; but as this is neither troublesome nor otherwise unpleasant to the patient, nor are the materials difficult to procure, camphor being everywhere a household drug, I believe that those who may give this treatment a trial will find it not only a simple but also a most effective remedy against coryza." (*Lancet*, May 31, 1884.)

Treatment of Ingrowing Toe-nail.—Professor Petersen, of Kiel, describes as follows his method of treatment in cases of ingrowing toe-nail. He removes the whole of the soft parts down one side of the nail, extirpates the nail itself, from antiseptic motives, and, after arresting bleeding by pressure, dresses the wound rapidly with oxide of zinc and cotton-wool. Fourteen days' rest in bed, with the foot raised, generally suffices for cure and the contraction of the cicatrix prevents a relapse to the old condition. Professor Petersen prefers general to local anæsthesia, on account of the troublesome bleeding afterwards: and for the same reason he does not approve of Esmarch's bandage in this operation. (*Deutsch. med. Wochenschr.*, March 27, 1884.)

The Co-ordination of Ventricular Action.—In speaking of the heart's action it is generally assumed that the muscular walls of the auricles and ventricles behave each as one muscle, and little regard is had to the really complex arrangement of the fibres, particularly in the ventricle, which must necessitate some regulating apparatus if the heart-beat is to be regular and rhythmical. Such a coördinating centre for the ventricular "muscles" has apparently been discovered by Drs. Kronecker and Schmey in the course of some experiments upon cardiac innervation, and the results of their observations were brought before the Verein für innere Medicin at Berlin, on the 26th May (*Deutsch. med. Wochenschr.*, No. 23, 1884). In introducing a needle into the heart wall of a dog for the purpose of one of these experiments, the ventricle suddenly ceased to beat as a whole, and remained in diastole with flickering irregular waves of contraction. This condition persisted on removing the needle,

but the auricles continued to pulsate. Stimulation of the vagi caused diastolic relaxation of the auricle, but did not affect the flickering contraction of the ventricle. This accident reminded them of similar phenomena occasionally noticed after the heart has been repeatedly injured; and by repeating the precise puncture in twenty other dogs the same result was invariably attained. The region injured was a small area at the lower boundary of the upper third of the ventricular wall near the course of the descending branch of the left coronary artery. At this well-protected spot they aver must be placed a centre which coördinates the ventricular contractions, and destruction of which serves, not to paralyse the muscular fibres, but to render their contractions inharmonious and inefficient. Sometimes these irregular contractions were violent, but at all times wholly different from the normal rhythm, the heart wall remaining lax, and not undergoing that hardening which the normal systole produces. To determine the point that the centre in question was not a motor centre, electrical stimulation was had recourse to; and it was found that when the electrodes were placed at a short distance from the named region, feeble induction currents had no notable effect, but strong ones produced the same permanent derangement as was observed on puncture at the spot itself. And when the electrodes were placed directly over the region weak currents sufficed to produce the same effect. It seems probable, then, that the cardiac paralysis induced by such stimulation, as observed by others, is attributable to the injury of this coördinating centre. It was also found that in asphyxia, carried beyond recovery of the normal contractions, the abnormal irregular fibrillar contraction could be restored under artificial respiration, the inference being that venous blood paralyses the cardiac muscle, but destroys the coördinating centre. In none of its reactions does it exhibit the characters of a motor or an inhibitory centre, its stimulation neither excites nor destroys movements; but it is remarkably sensitive to very slight irritation. This vulnerability may, it is thought, throw light on some cases of sudden death from "cardiac paralysis," and should the discovery be substantiated, a very notable addition will have been made to cardiac physiology and pathology. (*Lancet*, June 14, 1884.)

Bibliography.

Études sur la Pathologie du Rein. By Profs. Cornil and Brault. Roy. 8vo, pp. 308, with 16 Lithographic Plates. Paris: Félix Alcan. 1884.

A Manual of Diseases of the Throat and Nose, including the Pharynx, Larynx, Trachea, Œsophagus, Nose, and Naso-pharynx. Vol. II. (Œsophagus, Nose, and Naso-pharynx). By Morell Mackenzie, M.D. Lond., etc. Small 8vo, pp. 574; illustrated. 12*s.* 6*d.* London: Churchill. 1884.

A New Method of Treating Chronic Glaucoma, based on recent Researches into its Pathology. By George Lindsay Johnson, M.A., M.B., B.C., Cantab., etc. 8vo, pp. 48, with Illustrations. 3*s.* 6*d.* London: H. K. Lewis. 1884.

An Epitome of the Reports of the Medical Officers of the Chinese Imperial Maritime Customs Service from 1871 to 1882: With Chapters on the History of Medicine in China, Materia Medica, Epidemics, Famine, Ethnology, and Chronology in Relation to Medicine and Public Health. Compiled and arranged by Surgeon-General C. A. Gordon, M.D., C.B., Honorary Physician to H.M. the Queen, etc., etc. 4to, pp. 435. London: Baillière. 1884.

West African Hygiene, or Hints on the Preservation of Health and the Treatment of Tropical Diseases, more especially on the West Coast of Africa. By Charles Scovell Grant, M.D., etc. Second Edition. Sm. 8vo, pp. 51. Published for the Government of the Gold Coast Colony, by Edward Stanford. London. 1884.

Lectures on General Nursing, Delivered to the Probationers of the London Hospital Training School for Nurses. By Eva C. E. Lückes, Matron to the London Hospital. 8vo, pp. 229. 2*s.* 6*d.* London: Kegan Paul. 1884.

*** Any of the foreign works may be procured on application to Messrs. Dulau, of Soho Square, W.C.; Williams and Norgate, of Henrietta Street, Covent Garden W.C.; or Baillière, of King William Street, Charing Cross.

Department of Public Health.

THE RELATION BETWEEN PATHOGENIC AND SEPTIC BACTERIA, ILLUSTRATED BY RECENT RESEARCHES ON BACILLUS ANTHRACIS.

We propose in this article to give a *resumé* of Dr. Klein's [1] research on the relation of pathogenic to non-pathogenic bacteria. Bacillus anthracis was the pathogenic organism he chose to study for this purpose, and he proceeded to investigate whether it were possible by successive cultivations of the bacillus under varying conditions to bring about a change either in its morphological structure or physiological properties. This organism causes in cattle "splenic fever," and in man the different manifestations, anthrax and anthracæmia, or "wool-sorter's disease," according as its action is local or general. During the last few years many laborious researches on this organism have been made by able investigators, with the result that its life-history has been more fully studied and worked out than that of any other pathogenic organism.

By pathogenic bacteria are understood those which, by their introduction in infinitesimal doses into the blood or tissues of an animal, undergo development there, calling forth certain symptoms of disease which often end fatally. Within certain limits these symptoms are constant for one particular organism, that is, a classification of them can be made according to their pathological effects. On the other hand, septic, or better, non-pathogenic, bacteria are those which, introduced in slight amount into the animal economy, produce no effect, or only a

[1] Supplements to Eleventh (1881) and Twelfth Annual Report of the Local Government Board.

transient and slight constitutional disturbance. In fact they undergo no development whatever within the blood and tissues, these media being unfit for their propagation. Whatever effects upon an animal are traceable to the inoculation of a liquid containing septic bacteria are due, as it has been abundantly proved, to the chemical products (sepsin and the like) arising from their previous activity. Such a non-pathogenic bacterium very much resembling the bacillus anthracis is the so-called hay-bacillus. If an infusion of hay is prepared by a few minutes boiling only, a scum develops upon its surface in a few days consisting entirely of this bacillus, all organisms and spores in the hay having been destroyed, except the spores of the above bacillus, which are very resistant and require about half an hour's boiling to kill them.

Buchner regarded the hay-bacillus (bacillus subtilis) as identical with bacillus anthracis in the morphological structure. Both Koch and Klein maintain that there are decided differences in structure between them, apart from the motility of the hay-bacillus and the non-motility of the anthrax bacillus, the former observer stating that the differences are as great as one could expect in organisms of such simple structure. Starting with the idea of this morphological identity, Buchner was led to try if he could not by a gradual change in the conditions of cultivation convert the bacillus anthracis into the harmless hay-bacillus, and also bring about the reverse change of the innocuous bacillus to what he regarded as its deadly variety. He claims to have succeeded in both these endeavours. A research of this kind is beset with difficulties, which are almost insuperable, and the value of the results obtained can only be truly gauged by the care used to guard against all sources of error.

The first difficulty is to ensure that the cultivating media and all vessels and instruments used for experimentation are made absolutely sterile; afterwards the universal diffusion of septic bacteria in the air renders the contamination of the fluid during its inoculation with the organism likely, and this likelihood will increase proportionally with the number of cultivations of the organism that are grown. Again, there is the general law that when a number of successive cultivations is made of a

mixture of organisms, that one gains the upper hand and finally leads to the destruction of all the others for which the physical conditions under which the cultivation takes place is the most suitable. So that it is easily conceivable that one or a few spores of the non-pathogenic organism introduced into an early cultivation, not to speak of those entering during the establishment of later cultures, multiply so vigorously under the conditions favourable to their growth, that the original pathogenic organism, intentionally placed at a disadvantage by reason of the nature of the medium, disappears. This is the principle adopted by all investigators to obtain what is called "pure cultures" of the organism with which they are experimenting—*e.g.* Koch arrived at a growth of bacillus tuberculosis free from septic bacteria by successive cultivations of a mixture of these organisms in media of suitable composition.

The conversion of the anthrax bacillus to the harmless form was brought about in this way: A great number of cultivations of it were made in a solution of Liebig's extract of meat, and to prevent growth taking place from the bottom of the vessel, as is usually the case, the liquid was kept in a constant state of agitation. Koch asserts that here the most resistant of all spores, those of the bacillus subtilis (Cohn), gained entrance to the cultivating media, and finding the conditions favourable for their development, replaced the anthrax bacillus. Klein agrees with Koch's view, and notices further that Buchner did not get a diminution in the virulence of the organism proportionate to the number of cultivations it had previously undergone, for occasionally an active cultivation occurred subsequent to an inactive one. Buchner used white mice to test the virulence of his cultivations. Now, Klein maintains, as we shall see below, that the reason why some cultivations were inactive upon mice was that the conditions of experiment had not allowed spore-formation to take place in them, and that Buchner's explanation of a change in physiological properties of the organism is wrong; further he surmises that had guinea-pigs and rabbits been used instead of mice a fatal result would have occurred by inoculating these animals with the cultures inactive when tested on mice.

With regard to the change of hay-bacillus to bacillus anthracis,

one cannot read the description of Buchner's[1] experiments in the light of Koch's criticism without acknowledging the force of the latter. Buchner first grew the hay-bacillus in egg-albumen, which he necessarily could not sterilise, and subsequently inoculated from this cultivation defibrinated blood, collected from healthy animals with all precautions against external contamination. After a number of cultivations in defibrinated blood, he states that the hay-bacillus had become as virulent as ordinary anthrax bacillus. But we must remember that an organism developing in the non-sterilised egg-albumen other than hay-bacillus would have continued to grow in the blood—a very unsuitable medium for the growth of bacillus subtilis; and after a number of cultivations would have completely replaced the hay-bacillus. The interpretation placed on these experiments by Koch is that the bacillus of malignant œdema was most carefully isolated from the harmless bacterium. An organism is found in various putrefying liquids, hay-dust, garden-soil, &c., which, by its inoculation, does not give rise to typical anthrax but to a spreading œdema beginning from the seat of inoculation. This organism is called the bacillus of malignant œdema, and was confounded by Buchner with bacillus anthracis. Klein accepts fully this criticism, adding that in his cultivations he noticed no change in the naked-eye appearance of the growth of the bacillus anthracis, *i.e.* it always occurred as a mass at the bottom of the vessel, and a scum never formed on the surface of the medium unless contamination of the "culture" had occurred.

That the bacillus anthacis can have its virulence lessened by cultivation under altered conditions must be considered as finally established. Thus, Toussaint obtained this result by exposure of the bacillus to a temperature of 55° C. for ten minutes, or by the influence of a 1 per cent. solution of carbolic acid upon them. Pasteur and Koch both obtain a virus of diminished potency by cultivating the bacillus at 42°—43° C., and allowing the "culture" to remain at that temperature for some days. The results obtained by Klein do not agree with those of the above observers, for though he finds that the material becomes less virulent by several weeks growth in the same medium, he

[1] Buchner. Nægeli's *Untersuchungen u. nied.* Pilze. München. 1882.

explains it as due to a degeneration of the bacilli and not to a loss of potency in the bacilli.

His experiments were carried out with great care, and the method pursued is minutely described in the *Practitioner*,[1] to which we must refer the reader. Neutral pork-broth and gelatinised pork-broth were the liquid and solid cultivating media used in this research. Two or three days after the introduction of bacillus anthracis into neutral sterilised pork-broth, kept in the incubator at 20°—25° C. a whitish crop of bacilli is visible at the bottom of the vessel, forming a more or less filamentous mass, which subsequently extends until all growth ceases as a result of "exhaustion" of the medium. But for the first few days, after the inoculation of a flask filled with sterilised pork-broth, the liquid was not clear. This was due to the formation of bacilli which had not yet grown of sufficient length to sink to the bottom of the fluid of their own weight. When accidental contamination with other organisms occurs during the impregnation of the broth with anthrax poison, this becomes evident to the naked eye by the formation of a scum on the liquid, or by the persistent cloudiness of the latter. The bacilli grow to a certain extent, and then all development ceases; this is said to be due to the "exhaustion" of the medium; more probably it is due to the action of the products of decomposition generated by the growth of the organism on the bacillus itself. The nebulous mass mentioned above gradually shrinks, but this is not due, as one would *a priori* think, to a formation of spores in the filaments, with subsequent disintegration of the latter. This appearance is due to a granular degeneration of the protoplasm of the bacilli, leaving the sheath empty, with remains here and there of the protoplasm.

Besides this he describes another peculiar change of the bacilli, thus:—"Another change in the cell specimens is the appearance of spherical corpuscles, either isolated or in close rows or chains; in this latter case we have a thread of regular varicose appearance not unlike a chain of torula. The size of these spherical corpuscles is in their best development that of a human red blood-corpuscle, and in aspect they are identical with the gonidia of an oïdium or the cells of torula. They become

[1] Klein, *Micro-Organisms. Practitioner*, March, 1884.

elongated and by fission divide into, or by gemmation produce, two new spherical corpuscles. This change also has nothing to do with the formation of spores."

If in cultivation the growth of bacilli takes place near the surface, then a formation of spores results. Buchner stated that spore-formation only occurred when the bacilli were deficiently nourished; whilst Pasteur says that a temperature of 42°—43° C. prevents their formation. Klein dissents from both these statements, agreeing with Koch and Cohn that moisture, heat, and air, are the indispensable agents to this process.

He shows very prettily the dependence upon air for the production of spores by an experiment in which he places some anthrax bacilli on the surface of solid gelatine-broth contained in a flask. These grow, extending over the surface and liquefying the gelatine beneath, with profuse formation of spores. If left alone, the bacilli would grow into the depth of the medium, the spores would germinate, and the whole being covered with a layer of liquid, only bacilli would result. But if the fluid be carefully withdrawn by means of a sterilised pipette, the formation of spores by the bacilli left on the surface of the gelatine begins anew. The fluid drawn off contains numerous spores and bacilli, which undergo no change if the liquid be allowed to drop into a sterilised test-tube. On the other hand, he made exactly the same experiment as the last, but after liquefaction of a portion of the gelatine, he poured off the liquid layer, and heated the flask until the gelatine melted, allowing the spores and bacilli to sink to the bottom of the vessel. By boiling the melted gelatine for a few minutes the bacilli are destroyed, but not the spores, which after cooling germinate to a beautiful mass of intertwined threads, completely destitute of spores, unless the threads reach the surface and so obtain the oxygen which Klein maintains is requisite for the development of spores to take place. He concludes that "under most favourable conditions every elementary cell is capable of forming a spore; these spores are bright and glistening and do not stain. At first they are spherical, afterwards larger and oblong. If the cell is an elementary or cubical one, it forms one spore. . . . If the conditions are not so favourable, only a limited number of cells form spores; in the rest the protoplasm degenerates into

granular débris. When spores are formed they escape after the sheath breaks down."

He makes the interesting observation that anthrax bacilli are variable in size, mode, and time of propagation and spore formation, according as the cultivation takes place in alkaline and acid media or in neutral ones. Further, in opposition to Buchner and Koch he finds that development occurs in acid cultures, and even succeeded in getting a good propagation of anthrax bacilli in acid hay-infusion. Again, he asserts that the bacilli formed in artificial cultivations are twice the thickness of those discovered in an animal's body, and that slight differences in size exist between the anthrax bacilli developed in different species of animals.

The most interesting and practical portion of this research of Dr. Klein is that dealing with the effects of the inoculation of different animals with anthrax bacilli from various sources, and after artificial cultivation under varying conditions :

(i). *Inoculation with blood and tissues of animals dead of anthrax.*—The methods adopted are either to charge a needle by dipping it in the blood of an animal recently dead of anthrax, and then to thrust this beneath the skin of the animal to be experimented with ; or, as in the case of the larger animals, to bruise in water portions of the organs of smaller animals who have succumbed to this bacillus, and then to inject this liquid subcutaneously. When mice, guinea-pigs and rabbits, are inoculated, an œdematous swelling occurs at the seat of inoculation, and death usually takes place within forty-eight hours. If cattle are inoculated with blood of a guinea-pig or of a man dead of anthrax, the constitutional disturbance set up is not of sufficient intensity to lead to a fatal termination, nor does it protect the cattle so inoculated from natural infection.

Two sheep were inoculated with the blood of a guinea-pig dead of anthrax with a fatal result in both cases, whilst after inoculation of five sheep with blood of mice dead of anthrax no fatal result occurred, recovery from the rise of temperature produced taking place in three days. From this observation he draws this conclusion, "Thus we see that mouse's anthrax blood, while affecting constitutionally the sheep, did not-produce a fatal

effect, and at the same time furnished them with immunity against further inoculation with virulent material."

It has been stated by Pasteur that bacillus anthracis forms spores within the blood and tissues of an animal infected with it. This statement is stoutly denied by Koch and Klein, the latter observer affirming that no spores are formed in an animal's body, not even in the lungs, unless after the admission of air to the tissues by post-mortem examination. Further, he finds that the longer the interval which has elapsed between the death of an animal and the time of experimentation with its blood—provided the body has remained intact during that time—the less is the chance of finding living bacilli in the latter. The explanation given of this fact is, that a granular degeneration of the protoplasm within the sheath of the bacillus occurs after the death of the animal, a degeneration exactly resembling that described above, and that this process goes on until complete, when the bacillus is dead. Specimens of anthrax blood prepared by the Koch-Weigert method always show a greater or less number of the bacilli with their sheaths destitute of protoplasm. He made direct experiments to disprove Pasteur's theory, that a pasture is infected by burying cattle a few feet from the surface, the spores contained within the animal's body being brought to the surface in the intestinal canal of worms, and after deposition in the mounds made by these, remain at rest until by chance they gain admittance to the body of an animal grazing on that pasture. This is called the "earth-worm theory." Klein has proved that animals (mice and guinea-pigs) lost all power of infection after five days' burial, either by inoculation with their blood, or any organs, not even excepting the lungs.

(ii). *Inoculation with artificial cultivations.*—By the continual cultivation of anthrax bacillus in chicken-broth at a temperature of 42°—43° C., Pasteur claims to have a means of lowering the virulence of it, so that after four to six weeks the culture is no longer active. Neither the exact details of the process, nor any statement as to the animals used to test its efficacy, have ever been published; and contrary to what we are happy to say is unusual in scientific research, Koch in Germany and Klein in this country have had to spend a deal of time and money in

trying to discover the exact process, before they were able to test Pasteur's results. As a consequence of this cultivation Pasteur obtains weakened or "attenuated" viruses, which he uses to protect sheep from natural infection with splenic fever, by first inoculating them with a weak virus—*vaccin premier;* and a fortnight afterwards with a stronger one—*vaccin deuxième;* at the end of which the sheep are said to be immune against the anthrax poison, and indeed the Pouilly-le-Fort experience, in which of twenty-five sheep so prepared nine died after the inoculation of a more deadly virus, whilst of twenty-five others not so protected all died from same poison—shows that some degree of immunity can be conferred. Dr. Klein has not succeeded in obtaining "attenuated" virus by cultivation at 42°—43°. The animals used for test-purposes were white and tame brown mice, guinea-pigs, rabbits and sheep. The artificial cultivation was usually inoculated by introducing the sharp end of a freshly-drawn-out capillary pipette filled with the cultivation into the subcutaneous tissue of the animal.

The results of inoculation with these artificial cultivations was that in a few days the fatal effect on mice became more uncertain, though still fatal in infinitesimal doses to guinea-pigs and rabbits. The mice which did not succumb died after a later inoculation with more active material, hence no immunity had been conferred upon them, whilst if the very same cultivation which had previously failed had in the meantime been allowed to form spores and had again been inoculated, death occurred in a few hours. After a longer interval the results with guinea-pigs and rabbits also became uncertain, but fatal results could always be caused by using larger doses, the necessity of which he explains by the above-described degeneration of the bacilli, and, therefore, a greater amount of fluid being required before coming across a really active bacillus. Fatal effects are obtained with these rodents, by using enough of the cultivation for injection, as long as it is able to start a new cultivation. In contradiction with this stands Pasteur's statement that the bacillus loses its virulence on guinea-pigs before it becomes inactive.

The cause of this "attenuation" is ascribed by Pasteur to the continued action of the oxygen of the air, but, as mentioned

above, Klein claims to have proved that this would raise its virulence by giving rise to spore-formation. The explanation given by Koch in a recent research (*vide infra*) is, that this weakening of the bacilli is caused by the action of the products of decomposition formed in the cultivating medium. Further, Klein finds that if such an attenuated virus be used to start another cultivation, the latter attains the virulence of its predecessor in its early days. Pasteur asserted that an attenuated virus could be carried through many generations without an increase in its virulence, and here Koch is for once in agreement with the French observer. Thus Koch, Gaffky, and Löffler have cultivated an attenuated virus for two years without a change in its virulence or form. A cultivation of anthrax bacilli from the blood of either a mouse or a guinea-pig could cause death from typical anthrax, in sheep just as in guinea-pigs, when it had lost its effect on mice. Of two sheep inoculated by Klein with the bacillus grown at 42° C. both died, one out of two when the bacillus had been grown at 22° C., and neither of them when the mouse's blood was used.

Experiments were instituted by Dr. Klein with "vaccin charbonneux" obtained from Pasteur's laboratory through his agent. Two lots of the two kinds of "vaccin" were used, the first lot of "vaccin premier" killed one mouse out five, whilst the second lot killed five out of six mice, and also six out of nine guinea-pigs. The first sample of "vaccin deuxième" killed two guinea-pigs previously inoculated with the "vaccin premier," and caused distinct constitutional disturbance in two sheep, which succumbed later to inoculation with a cultivation at 42° C. for twenty-one days. From these experiments, which perhaps are not numerous enough to allow of any safe deductions being drawn, we see that these "vaccins" are not uniform in virulence, and that they are not protective. But these results are almost identical with the careful and more numerous experiments made by Koch on this subject.

The "vaccin premier" was found by Klein to be contaminated with a micrococcus and another bacillus by inoculating some pork-broth with it. The "vaccin deuxième" was likewise found impure. This observer states distinctly that a cultivation in

which the bacilli have partially degenerated and which had lost the power to cause virulent anthrax is absolutely ineffective in conferring immunity against future inoculations.

These results of Klein are not confirmed in their entirety by the more recent research of Koch, Gaffky, and Löffler.[1] In this methodical and laborious investigation, these observers have been much more successful than Klein in obtaining a virus resembling Pasteur's. In cultivations made at 42°—43° C. "the culture" had about the fifteenth day attained a virulence similar to that of "vaccin premier," in that it killed mice by inoculation and not guinea-pigs. On the eleventh day the virulence was equal to that of "vaccin deuxième," killing mice, and about 50 per cent. of guinea-pigs, inoculated with it. There is a great contradiction between Klein's results and those obtained by other observers when they inoculated animals with attenuated cultures. Thus Klein finds that mice first fail to be fatally affected when inoculated with an artificial cultivation which still kills rabbits and guinea-pigs. On the other hand, Koch, &c., found that the "culture" first fails with mice and then with guinea-pigs. There is no evident explanation of this difference, but it is possibly due to the difference in breed of the animals used by the different experimenters. That breed and even individuality have great influence upon the character of the disturbance set up by anthrax poison is well known; thus Chaveau found that Algerian sheep were almost immune against anthrax. These observers made a great number of experiments, using cultures of about the above degrees of virulence as their first and second "vaccins," a full description of which, we regret to say, the limits of our space prevent. By these experiments it is abundantly proved that though a certain degree of protection is conferred upon animals by this inoculation, yet the percentage of deaths, when sheep previously "vaccinated" are inoculated with the unweakened anthrax, is still high. They then tried if it were not possible to lower this percentage of fatal results when sheep previously twice "vaccinated" are inoculated with unweakened virus, by vaccinating animals oftener than twice, using for the later inoculations cultivations of higher virulence than the "vaccin deuxième." Their results were not encouraging; thus

[1] *Mittheilungen aus dem Kaiserlichen Gesundheitsamte*, 1884.

of five sheep previously vaccinated four times with anthrax bacilli of gradually increasing intensity, two died when inoculated with anthrax from the lung of a mouse.

Natural infection was supposed by Pasteur to take place through the organism gaining access to the tissues by small abrasions in the mouth and pharynx made by the food. The above observers question this, and also assert that the extravasation of blood in the anterior part of the neck upon which Pasteur lays such stress as showing that infection takes place in the throat, occurs in all forms of anthrax poisoning. They gave anthrax bacillus to sheep in such articles of diet that no abrasions of the mucous membrane would be formed, and got no symptoms whatever of disease. But if the bacilli were allowed to form spores and were then given under the same precautions, death occurred in all cases. The explanation offered of this difference is that the gastric juice destroys the bacilli but is powerless against the spores. The single experience of Klein, where a mouse ate the organs of its fellow dead of anthrax without becoming diseased, and cited by him as opposed to the doctrine of the communicability of anthrax from the alimentary canal, is in reality in complete agreement with this view, for spores were not present in the animal's body.

The post-mortem appearances were congestion, swelling, and redness of the mucous membrane of the fourth stomach near the pylorus, it being continued along the duodenum and small intestine; the erosion being specially marked in Peyer's patches and solitary glands; the mesenteric glands were also enlarged. If old spores were given to the sheep, death occurred just the same, though the interval that elapsed between their administration and death was longer. To uphold the process of "animal vaccination" Pasteur asserted that natural infection was much less deadly than the inoculation practised with virulent anthrax bacilli. But Koch, Gaffky, and Löffler, on the view that the above is the natural manner of infection, found that it is the reverse; thus, they gave spores in food to sheep protected from ordinary anthrax bacilli by previous vaccinations, and yet a high percentage of deaths occurred.

They have examined some of the "vaccins" supplied by Pasteur's agent. The "vaccin premier" killed mice alone, the

"vaccin deuxième" mice and guinea-pigs, whilst several tubes were contaminated with bacteria: results exactly confirmatory of Klein's with the same "vaccins." But the "vaccins" were not of the uniform virulence so shortly expressed above, nor did they confer immunity upon sheep. As an explanation of the fact that in several cultivations of the same bacillus, under the same conditions as far as possible, and of the same age, the virulence differed to some extent in the "cultures." This is due to slight variations of temperature, for after six days at 42°·8 C. guniea-pigs were no longer killed by the culture, whilst the same stage was not reached until ten days at 42°·6 C.

With regard to the question, whether a pasture notoriously infected with anthrax will be disinfected in the winter time, Klein finds that a temperature of 12° to 15° C. will not kill spores; whilst more recently Arloing has found that the most intense cold it is at present possible to produce is equally ineffectual. On the other hand, no development of spores takes place in bacilli below 15° C.

To sum up the result of these laborious investigations we must agree with Koch and Klein, that immunity can be conferred by inoculation, but this immunity can only take rank as an interesting theoretical fact not yet brought within the region of practical science. We must deny Pasteur's claim, that his method of animal inoculation gives absolute immunity, and that it is harmless, the number of fatal results being nil, or very small. There is no doubt that when Pasteur performs his inoculations without any deaths, he is working with cultures too weak to give any immunity, and also that in many cases the "virulent" anthrax bacilli sent out by him as a test for the protection already conferred by vaccination are much too weak. The "vaccins" as supplied by him have been found very variable; thus sometimes the "vaccin premier" has killed a flock of sheep, whilst "vaccin deuxième" has been inert. The objection to the present method is that immunity can only be conferred by a percentage of losses from death greater than that which would result if the flock were turned upon a notoriously infected pasture; and that further, this inoculation favours the spread of the disease to other animals by the formation of spores where any of the bacilli fall on the wool

of the animal; also the immunity thus given lasts at the most favourable computation no longer than a season. That it may be possible in the future to discover a method of obtaining immunity without too great a loss during the process must be allowed. But to consider it proved that at present we possess such a means in the method of inoculation as described by M. Pasteur, can only lead to disappointment and to a monetary loss on the part of those adopting it.

PUBLIC HEALTH IN MARYLAND.

The reports which are now regularly issued by the various State Boards of Health of the United States of America, are steadily forming some of the most valuable contributions to sanitary literature, and some of the subjects they deal with are matters which now rarely or ever find their way into reports either of the central sanitary authority, or of local medical officers of health, of this country. Amongst these subjects is that of malaria, which is dealt with in the Fifth Biennial Report of the State Board of Health of Maryland, and also in an account of the first annual meeting of the Sanitary Convention of the Board of Health for that State. The sickness which is known under the name of malaria, and which has been practically banished from our own country, is a constantly recurring source of anxiety in many parts of the United States, and it is estimated that in Maryland alone the industrial interests are damaged to the extent of nearly one million dollars a year by malaria. Indeed, there are no less than some 500,000 acres of marshy land in Maryland, which are credited with poisoning the surrounding atmosphere with their noxious exhalations. Some of these lands are permanently covered with water, others only intermittently so. As regards these two conditions of wetness referred to, there is some evidence that it is the latter rather than the former that conduces to the production of material poisoning, and this has been noted by some who are well acquainted with the history of intermittent fever in our eastern counties. Thus, when some of the fen country in Cambridgeshire was so drained

that the dykes were at one time full, or partly full, of water, and at another time dry, those in their vicinity suffered periodically from ague. Now that the machinery of pumping is more under control, steam being used instead of wind-mills, and the dykes being so kept as to contain at all times much the same quantity of water, the disease is all but unknown. Indeed, the main physical conditions specially leading to malaria must be regarded as consisting of a marshy soil, which is at one time wet and at another is either partially or wholly dry, as the result of drought, heat, or of mechanical measures such as are brought about by pumping operations.

The task which lies before the Maryland Board of Health is a large one, and Dr. Chancellor, the secretary, discusses the various ways in which it may be carried out. The use of the eucalyptus tree in connexion with marsh fever must be regarded as having a distinct value. In Algeria its culture has been attended with remarkable results; districts which were formerly unhealthy in the extreme being now, to all intents and purposes, free from intermittent fever. Dr. Fedeli's reports as to its influence in Italy are to the same effect, he having alleged that malarial districts have been either entirely, or to an important extent, deprived of their malaria as the result of planting this tree in sufficient numbers. In referring to the influence of the eucalyptus, Dr. Chancellor refers to the testimony of Professor Gubler, who attributes its properties to the aromatic vapours which emanate from the tree, and to the preservative power of the branches and leaves which fall upon the marshy soil, and he alleges that by the natural atmospheric oxidation of the oils of eucalyptus and the pine, there is produced an almost illimitable amount of peroxide of hydrogen and camphoraceous matter, "which must perforce act according to their chemical natures upon the pestilence that may be floating in the air, and upon the animal and vegetable matters that may be rotting in the soil."

But whatever the attributes of the eucalyptus, and even granting that the climate of Maryland, as also that of other parts of the United States where malaria are so grave a source of sickness, is adapted to the growth of this tree, it would be a greater advantage from every point of view if the lands now leading to the production of intermittent fevers could be

effectually drained and brought under cultivation, than if they were merely planted with the eucalyptus. The acreage needing this treatment in Maryland alone is admittedly large, but it is small compared with that which has been dealt with in other countries, where fen-fever has been abolished, and prosperity has resulted from the reclamation of large tracts which heretofore were only a source of mischief. Dr. Chancellor's report refers, indeed, in this connexion to the draining of Harlam Lake in Holland, to somewhat similar works in the county of Fife in Scotland, to the dangers which strangers formerly experienced in visiting marshy districts in England which are now covered with luxuriant crops and a prosperous peasantry, and to the fact that the hardy Dutch have it in contemplation to reclaim by drainage another instalment of the Zuyder Zee, which in area will equal that needing to be dealt with in Maryland. If the necessary labour could be secured in Maryland, there can be no question but that the construction of proper dykes, and the draining of this land, which now, by reason of the sickness which it produces, constitutes so serious a tax on the revenues of the State, would in the long run be attended with a considerable sanitary and financial success.

A debate which followed in the Sanitary Convention fell short of what might have been anticipated, mainly because the term malaria, which is already far too vague and too general, was made to include ordinary conditions of foul air from excremental and other sources, and as a consequence the discussion tended to wander off in the same direction. In malarial districts diseases which are brought about by the common conditions leading to the fouling of air tend to put on a special malarial character, and so the two causes co-operate in the production of a hybrid malady; but this is hardly a reason for considering the two states together as if they were necessarily allied; and it seems very certain that whatever may be effected by the mere construction of surface drainage and of dykes towards removing the sources of malarial poisoning, these will not do away with the circumstances leading to typhoid and other affections having their source in filth-conditions, unless the formed works are supplemented by the provision of drainage for sanitary purposes, of such means for the disposal of excreta as shall be free from

offensiveness and of danger to health, and of a water-supply free from the risk of excremental contamination.

These latter subjects engaged a considerable amount of the time devoted by the Convention to the consideration of sanitary matters, and some very interesting papers were read on the disposal of sewage and of house-slops. The paper by Major Charles H. Latrobe on sewage systems dealt with the system of dry removal and of water carriage in considerable detail, and also raised the question as to the value of the Liernur pneumatic system. This was followed by a somewhat similar paper by Colonel Waring, who challenged conclusions as to the Liernur system which had on another occasion been arrived at by the Secretary to the State Board of Health. Colonel Waring, speaking as an engineer, maintained that such a system as applied to Baltimore would be the reverse of economical in construction and in annual expense, and that from almost every point of view the system, if adopted, would end in failure. Dr. Chancellor's answer to Colonel Waring, together with the preceding papers and the discussion, constitute perhaps the most exhaustive account of the various arguments which may be raised in favour of, or against, the pneumatic system of sewage disposal, and as such they deserve careful perusal. Dr. Chancellor is evidently a warm advocate of the system. He admits that, as yet, the system has not been put to a practical test except for the removal of the contents of water-closets, but he points to the decision of the city of Amsterdam, after ten years' experience, to enforce its application to all new buildings within its limits: he asserts that, as the result of an examination made as lately as the autumn of 1883, the closets attached to the system are perfectly inodorous, even where they were in use by careless people; he regards the arrangements made by Captain Liernur for purifying the house-waste as at once simple and effective, and says that the product is less impure or dangerous than the effluent which is practically produced by surface irrigation; and he maintains that the high working expenses which attended the earlier labours of Captain Liernur were due to circumstances which are not likely to recur, and that both on this point and as regards certain failures attaching to his first experiments, are no criterion of what can be effected under the system after it has undergone

the changes and improvements incident to eight or ten years experience. The Liernur system has certainly not found much favour in this country. Whether the prejudices which have been formed against it are to be overcome or not will much depend on the success which may attend its application to some city where the more ordinary system of water-carriage is, for one or another reason, not regarded as practicable. Cities in the United States which are as yet without any settled system of sewerage are able to profit by the experience of all the systems known to the civilized world, and methods which have, for want of completeness, been regarded as failures in the Old World, will doubtless have a chance of success in the New one, which will be the better for the improvements which time has shown to be absolutely necessary to their efficient working.

THE PRACTITIONER.

OCTOBER, 1884.

Original Communications.

MICRO-ORGANISMS AND DISEASE.

BY E. KLEIN, M.D., F.R.S.

Joint-Lecturer on General Anatomy and Physiology in the Medical School of St. Bartholomew's Hospital, London.

(*Continued from* p. 180.)

CHAPTER XIX. (*continued.*)

ONE of the most important points, and the most difficult of comprehension, is this power of the pathogenic organisms to resist the influence of the healthy tissues of the living animals, a power which we have said above is not possessed by the non-pathogenic organisms. A careful analysis shows at the outset that this power of the pathogenic organisms is not possessed by them indiscriminately, for while a particular species is in some animals capable of overcoming the influence of the living tissue *i.e.* of multiplying and producing the particular disease, in other animals it is not capable of doing this, and hence the animal remains unaffected—it is said to be not susceptible to the disease. Thus, for instance, the bacillus anthracis when introduced into a human being, or a herbivorous animal, is capable of multiplying and of producing anthrax, whereas in carnivorous animals and even in the omnivorous pig it is not capable of doing so. Or again, the bacillus of swine-plague while capable of producing the disease in swine, rabbits, and mice, is not capable

of doing so in man, bird, the guinea-pig, or carnivorous animals. Now, where are we to look for this difference in behaviour? The tissues and juices of a pig when obtained as infusion or otherwise are just as good a nourishing material for the bacillus anthracis as the tissues and juices obtained from a herbivorous animal; artificial cultures of the former and of the latter behave in exactly the same manner, both as regards copiousness of growth and virulence of the bacilli. Again, artificial cultures of the bacillus of swine-plague made in juice of the tissues of the guinea-pig or fowl are exactly the same as those made of the juice of the tissues of a rabbit or pig. The tissues, therefore, *per se* cannot be said to possess any inimical action on the organisms. The living condition *per se* also cannot have this power, since we said that the power to overcome the influence of the living tissue is precisely the great distinguishing character of pathogenic organisms. There remains, therefore, only one thing, that is that there is something or other present in a particular tissue to which this latter owes its immunity, and this something must of necessity be connected with the tissue while alive, as we said before. Now, the life of the tissue in the pig cannot be different from that of the mouse, if by life is understood the function of the tissue, the connexion with the vascular and nervous system, and all the rest of it. The subcutaneous connective tissue has no different function, no different relation to the vascular and nervous system in the pig from what it has in the mouse, and nevertheless we find that it behaves very differently in the two cases towards the bacillus anthracis. This something then, which inhibits the growth and multiplication of the bacillus anthracis in the tissue of the pig but not in the mouse, must be something which although dependent on the life of the tissue, is not identical with any of the characters constituting the life of the tissue, but must be some product of that life. To assume then, as is done by some observers, that the living state of the cells *per se* is the inhibitory power does not cover the facts, as we have just shown. The most feasible theory seems to me to be this, that this inhibitory power is due to the *presence of a chemical substance*, produced by the living tissues. It does not require any great effort to conceive and it does not seem at all improbable, that the blood and tissues of

the pig contain certain chemical substances which are not present in the mouse, substances which like so many others chemistry is not yet capable of demonstrating. But that there exist vast and gross differences in the chemical constitution of the blood and tissues of different species of animals there can be no reasonable doubt; it is a fact with which physiological chemistry is quite familiar.

We arrive then, after all this, at the conclusion that owing to the presence in the blood and tissues of particular chemical substances, present only during life, and a result of the life of the tissue, the organisms in a particular case cannot thrive and produce the disease. And further that for each particular species of organism there is a particular chemical substance required to exert this inhibitory power, for as we have seen while the anthrax-bacillus is not capable of thriving in the pig, it does well in the guinea-pig, while the bacillus of swine plague thrives well in the pig, it does not in the guinea-pig. The incapability of non-pathogenic organisms to thrive in healthy living tissues would on this theory be explained by the assumption that these chemical substances present in every healthy living tissue are inimical to all putrefactive organisms.

What we have said hitherto refers only to the healthy living tissues. It is quite possible to imagine that, owing to the presence of a particular chemical substance in the healthy living tissue, a pathogenic organism is not able to thrive in a particular animal; but under certain abnormal conditions, when for instance owing to a diseased or altered state of the tissue that substance is absent. the organism might be enabled to exist and multiply and to produce the disease. Supposing it to be true that a person so long as he is healthy and well is able successfully to withstand the growth of a particular pathogenic organism, he is then insusceptible to the disease; but we can understand that if the alimentary canal or the lungs be diseased, then the organism passing into the bowels by ingestion or into the lungs by inspiration would find there a tissue in which the necessary inhibitory substance, present in the healthy state, might be absent, and the organism would be capable of thriving and of producing the disease.

The next point to consider is the relation of the specific

micro-organism to the essence of the disease, or in other words the question whether the organism itself is the virus or whether this latter is the product of the former, something in the same way as the septic ferment is the product of the putrefactive organisms?

That the virus in the infectious diseases is intimately connected with the organisms is proved by the fact, that the virus introduced into the body multiplies *ad infinitum*; for instance in anthrax or tuberculosis after the introduction of an infinitesimal dose, we find that the disease (malignant anthrax or general tuberulosis respectively) sets in in its virulent form; in the first case every drop of blood teems with the bacillus anthracis; in the second (tuberculosis) every tuberculous caseous particle in the lymph-glands, lungs, spleen, and liver contains the bacilli; in both instances crops of the bacilli are produced in the afflicted body, and every particle of the tissue containing the bacilli is capable of starting the disease when introduced into a fresh subject. Moreover, the artificial cultures of the pure bacilli are possessed of the same pathogenic power. The same holds good for leprosy, for erisypelas, for swine-plague, &c. So that the proposition that the organisms are intimately connected with the virus must be considered as well established.

But even after this it remains an open question whether the organism is identical with the virus or whether the organism is concerned in elaborating the virus—a sort of ferment; and further, whether the virus being the latter's product, is obtainable apart from the organism.

Let us start with the proposition that the virus is a product of the organism, a sort of non-organised ferment, but not the organism itself, although this latter is essential for the creation of the virus.

Inoculating a few bacilli anthracis into the subcutaneous tissue of a suitable animal, *e.g.* a guinea-pig, we find after twelve to twenty-four hours the first indications of illness, consisting in a local swelling and a general rise of the body-temperature. At this time there are present in the local swelling bacilli, but only in small numbers; in the blood the bacilli are very scarce indeed, so scarce that it is difficult to meet with one bacillus in an appreciable quantity of blood. By this time then the bacilli

could not have produced the change by their "numbers" alone. Immediately before death, sometimes some hours, we find in most instances the blood teeming with the bacilli, but this is by no means in all cases; I have seen a considerable number of deaths from typical anthrax in the mouse, guinea-pig, rabbit, and sheep, occurring from forty-eight to sixty hours after inoculation, in which the number of bacilli of the blood and tissues was extremely small; they were present, but only here and there was there one to be found. That the bacilli are present some hours before death in the shape of spores, as has been maintained by Archangelski, I have disproved in a former chapter. In those cases in which the bacilli are scarce even *in articulo mortis* and immediately after death, the scarcity is not due to the bacilli having already degenerated, since the degenerating bacilli are not noticeable in any way in these instances. It remains then to assume that death occurs in these cases not owing to the presence of the bacilli in numbers; that is to say, that it is neither owing to their appropriating from the blood-corpuscles the available oxygen necessary for their multiplication (Bollinger) and thus producing death by asphyxia, nor to their mechanical effect in plugging up the capillaries of vital organs, a theory upheld by some observers from the fact that in most cases the capillaries appear filled with the bacilli, and in some cases in extensive regions, lung, kidney, and spleen, the capillaries are almost occluded by the bacilli. We must assume, then, that although as a rule immediately before death all the conditions are present to enable the bacilli to multiply readily and to produce a large crop, this is not necessarily connected with the cause of death, being in fact a consequence of the animal being *in articulo mortis;* but that the immediate cause of death is the chemical alteration produced by the bacilli in the blood and tissues. For producing this effect it is not necessary to have more than a certain number of the bacilli. As soon as this number is reached death follows. The same may be said of other pathogenic organisms. Thus for instance in the case of tubercle-bacilli, after the introduction of these into the subcutaneous tissue of a guinea-pig, multiplication takes place, and after they reach a certain number, the nearest lymph-glands become swollen and inflamed and then caseous; but this stands in no

relation to the number of the bacilli, for in some instances the microscopic examination reveals only very few bacilli, they are scattered in very small numbers over very wide areas. And the same is observed in the tuberculous deposits of the internal organs. In some of them the bacilli are exceedingly scarce, while in others neither more nor less advanced they are numerous. Here also we must assume that as soon as a certain, perhaps even small, number of the bacilli has been produced the chemical effect produced is sufficient to be the cause of a certain pathological change. In glanders, the nodules in the skin and lung reveal sometimes even under the most careful examination after approved methods the presence of but very few bacilli. In swine-plague, in the lungs, which in severe cases are enormously affected, sometimes only very few of the pathogenic organisms can be discovered. It follows then that the pathological condition brought about by the organisms is not due to the direct action of their numbers; but is an indirect sequence, brought about by definite chemical alterations in the blood or tissues as the case may be.

In this we may assume two theories as possible: (*a*) It is possible that these chemical effects are produced by the presence and growth of the organisms, as truly as in the alcoholic fermentation of sugar the alcohol produced is a result of the presence of the saccharomyces; alcohol is only in so far a product of the organism as this, in its multiplication, assimilates some molecules of carbon and hydrogen abstracted from the sugar, and in consequence of this loss the sugar yields alcohol; but it is not, as it were, a secretion of the organism, a special ferment. (*b*) But it is likewise possible that the organism elaborates a special ferment, which, after a certain amount has been produced, sets up the particular pathological changes.

From these considerations it follows that the virus cannot be considered independent of the organism; we cannot assume that the two can be separated from one another; for, as we have just now shown, the most feasible assumption, and the one borne out by observation, is that, owing to the multiplication of the organisms, certain chemical changes are produced in the blood and tissues, or that a special ferment is created, which sets up the anatomical changes characteristic of the particular disease.

CHAPTER XX.

VACCINATION AND IMMUNITY.

We have in the foregoing chapter tried to show that owing to the presence in the normal blood and tissues of a living animal of some chemical substances varying in the different species, and inimical to particular pathogenic organisms, the latter, when introduced into the tissues of the particular species, cannot thrive, and that it is for this reason that the animal is not susceptible to the corresponding disease. Now, how do we explain the fact that a human being or an animal having been once the subject of a particular infectious disease, becomes thereby in some cases insusceptible to a second attack? The oldest and perhaps the most favoured theory to explain this immunity is that which assumes that during the first attack the organisms growing in the body consume, or are instrumental in eliminating or destroying, some chemical compound necessary for the existence and multiplication of the organism. As soon as this substance has become consumed or destroyed the organisms cannot further multiply, and therefore the disease ceases; and further, that owing to the subsequent absence of this same chemical compound, a new infection by the same organisms is not possible, *i.e.*, the individual is protected. Thus this theory puts the case on a level with, say, the relation of the saccharomyces to the alcoholic fermentation; as long as a solution contains sugar, the saccharomyces is capable of multiplying, but as soon as all the sugar has disappeared as such, *i.e.*, has become split up into alcohol and carbonic acid, the fermentation ceases, the solution being now exhausted as regards the saccharomyces; a new charge of saccharomyces put into the solution is not capable of multiplication. This theory, then, to explain the immunity, is generally spoken of as the *Exhaustion Theory*.

On careful analysis, it will be found that it is not capable of explaining all the facts of the case. As we mentioned in a former chapter, cattle inoculated with blood of a guinea-pig dead of anthrax become affected with anthrax, which, although

not fatal, is nevertheless sometimes very severe. The animal recovers, and is now, for a time at least, secure against a second attack. But there is absolutely no ground for the assumption that if an infusion of the tissues of this animal were made, the bacillus anthracis sown in it would not thrive luxuriantly, seeing that bacillus anthracis grows on almost anything that contains a trace of proteids. Similarly when of the tissues of a guinea-pig, or mouse, or rabbit, dead of anthrax, an infusion is made, and this is used as nourishing material for bacillus anthracis in artificial cultures, it is found that these latter thrive splendidly. The same fact I have observed in the case of swine-plague. There is then no reason whatever for assuming that, after one attack of illness, the blood and tissues become an unfavourable soil for a second invasion of the same organism, and that this change is due to the exhaustion of some necessary chemical compound.

There is another theory, commonly spoken of as the *Antidote Theory* (Klebs). According to this, the organisms growing and multiplying in the body during the first attack produce, directly or indirectly, some substance which acts as a sort of poison against a second immigration of the same organism. I am inclined to think that this theory is in harmony with the facts. There is nothing known, from the observations before us, which would negative the possibility of the correctness of this theory; nay, I would almost say all our knowledge of the life of the micro-organisms points to the conclusion that the different species are associated with different kinds of chemical processes, and that as a result of the activity we find different chemical substances produced.

The different fermentations connected with the different species of fungi afford striking illustrations of this view. According to this theory, we can well understand that—just as in the case of an animal, say a pig, insusceptible to anthrax—the insusceptibility being due to the presence in the blood and tissues of a particular chemical substance inimical to the growth of the bacillus anthracis—so also in the case of a sheep or ox that has once passed through anthrax—there is now present in the blood and tissues a chemical substance inimical to the growth and multiplication of the bacillus anthracis whereby

these animals became possessed of immunity against a second attack of anthrax.

Whether this chemical substance has been elaborated directly by the bacilli, or whether it is a result of the chemical processes induced in the body by the bacilli during the first illness, matters not at all; it is only necessary to assume that the blood and tissues of the living animal contain this chemical substance.

Some observers (Grawitz, &c.) are not satisfied with this theory, but assume that owing to the first attack the cells of the tissues so change their nature that they become capable of resisting the immigration of a new generation of the same organism. There is absolutely nothing that I know of in favour of such a theory; it is impossible to imagine that the cells of the connective tissues, of the blood and of other organs, owing to a past attack of scarlatina, become possessed of new functions or of some new power, as, for instance, a greater power of oxidising, or the like. Connective tissue-cells, blood-corpuscles, liver-cells, and other tissues are, so far as we know, possessed of precisely the same characters and functions after an attack of scarlatina as before.

On the whole, then, we may take it as highly probable, that owing to the presence in the normal blood and tissues of a living animal of a chemical substance inimical to the growth of a particular micro-organism, this animal is insusceptible to the disease dependent on the growth and multiplication of this micro-organism; and further, that in those infectious maladies in which one attack gives immunity against a second attack of the same kind, one attack produces a chemical substance in the blood and tissues which acts inimically to a new immigration of the same organism; hence the animal becomes insusceptible to a new attack, or is "protected." This is not the case with all infectious maladies, for, as is well known, in a good many instances a single attack does not protect against a second; and, as is also well known, a first attack may protect but only for a limited period, or for a period greatly differing in different individuals. All this would be explained by our theory in the same way, as it is explained by the other theories; viz. when one attack does not protect, no inhibitory chemical substance has been

produced; while in those diseases in which one attack does protect only for a limited period, the necessary inhibitory substance has only lasted for a limited period, and so on.

CHAPTER XXI.

ANTISEPTICS.

In former chapters we have on several occasions mentioned that a variety of substances and conditions are capable of exerting a detrimental influence on the life and growth of micro-organisms. Amongst these are—The presence of certain substances in the nutrient soil, the temperature, and some chemical products, such as those belonging to the aromatic series, phenol, indol, skatol, &c. The presence of certain substances in the nourishing material is, as we have seen, an essential condition, *cæteris paribus*, for the growth and multiplication of micro-organisms. Thus pathogenic organisms cannot thrive in an acid medium, they cannot thrive if proteids or allied compounds and certain inorganic salts are absent; putrefactive and zymogenic organisms, on the other hand, or, at any rate, some of them, are capable of thriving well in acid media (*e.g.*, the bacillus subtilis in acid hay-infusion, the micrococcus ureæ in acid urine). Further, many (not all) pathogenic organisms cannot thrive unless they are exposed to a certain degree of warmth; they thrive best at blood-heat, while putrefactive and many zymogenic organisms thrive well at ordinary temperatures, though of course their growth is more rapid at higher temperatures, such as 30°—38° C. Heat above 50° or 60° C. arrests the growth of and even kills many organisms, except the spores of bacilli, which, as we find on a former page, survive even when exposed to the temperature of boiling water for several minutes. The presence of carbolic acid, phenol, thymol, salicylic acid, perchloride of mercury, &c., prevent even when in great dilution the growth of micro-organisms.

In any enquiry into the influence of one substance or another on micro-organisms it is necessary to bear in mind that the influence of certain conditions on the micro-organisms may be a twofold one: (1) the condition may be unfavourable to the

growth of the organism in question, and (2) the condition may be fatal to the life and existence of it. The second condition involves, *a fortiori*, the first; but the reverse is not the case. Owing to the failure to distinguish between these two propositions a great deal of confusion has arisen on the subject. One hears constantly of this or that substance as an "antiseptic," meaning by this a substance inimical to the life of micro-organisms, or a substance is a "germicide," implying by this that this substance kills the organisms; but when one comes to analyse the observations that are said to establish this reputation for a particular substance, one finds that the substances in question are really only detrimental to the growth of the organisms.

By sowing any micro-organism into a nourishing medium, to which has been added a certain substance (*e.g.* carbolic acid to the amount of 1 per cent.), and exposing this medium to the conditions of temperature, moisture, &c., otherwise favourable to the growth of the organism, if we find that after the lapse of a due period the growth is retarded or altogether inhibited, the conclusion is drawn that this substance (viz. the carbolic acid of 1 per cent.) is an antiseptic. There is nothing more fallacious than this method of reasoning; a great many micro-organisms can be exposed to a 1 per cent. solution of carbolic acid for hours without in the least being affected, for on being then transferred to a suitable nourishing medium they grow and thrive well. Similarly by placing the spores of bacillus anthracis in a proteid medium containing perchloride of mercury of the strength of 1 in 300,000, it is found (as Koch has shown) that the spores are absolutely incapable of germinating. But if from this the conclusion is drawn, that perchloride of mercury of the strength of 1 in 300,000 is a germicide, I should most strongly dissent, for perchloride of mercury even of the strength of 1 per cent. is not a germicide any more than vinegar; for on placing the spores of bacillus anthracis in a proteid medium, to which so much vinegar or any other acid has been added as makes it decidedly acid, it will be found that the spores do not germinate.

In order to pronounce a certain substance an antiseptic in the strict sense of the word, it is necessary to place the organisms

in this substance for a definite time, then to remove them thence, and to place them in a suitable nourishing medium; if they then refuse to grow the conclusion is justified that the exposure has injured or destroyed the life of the organisms. In the case of pathogenic organisms a substance to be pronounced a germicide must be shown to have this power, that when the organism is exposed to the substance and then introduced into a suitable artificial medium it refuses to grow; and it must also be shown that when introduced into a suitable animal it is incapable to produce the disease which the same organism, unexposed to the substance in question, does produce.

I have made a good many observations on the influence of antiseptics on micro-organisms, both putrefactive and pathogenic, and I have found that many assertions hitherto made on this subject, treated in the above light, are absolutely untrustworthy and erroneous.

Various species of putrefactive micrococci, bacterium termo, bacillus subtilis, various pathogenic micro-organisms, as bacillus anthracis, bacillus of swine fever, absolutely refuse to grow in media to which is added phenyl-propionic acid, or phenyl-acetic acid, to an amount so small as 1 in 1,600; but if the same organisms are exposed to these substances in much stronger solutions, 1 in 800, 1 in 400, or even 1 in 200, and then transferred to a suitable nourishing material, it is found that they have completely retained their vitality, they multiply as if nothing had been done to them. I have exposed the spores of bacillus anthracis to the above acids of the strength of 1 in 200 for forty-eight hours and longer, and then inoculated guinea-pigs with them, and I found that the animals died of typical anthrax in exactly the same way as if they had been inoculated with pure spores of the bacillus anthracis.

Koch[1] has published a large series of systematic and most valuable observations, made in testing the influence on spores of bacillus anthracis of a large number of antiseptics (thymol, arsenite of potassium, turpentine, clove-oil, iodine, hydrochloric acid, permanganate of potassium, eucalyptol, camphor, quinine, salicylic acid, benzoic acid, and many others), and amongst them he found perchloride of mercury to be the most powerful, since even

[1] *Mittheil. aus d. k. Gesundheitsamte*, Berlin, 1881.

a solution of 1 in 600,000 is capable of impeding, one of 1 in 300,000 of completely checking, the germinating power of the spores. To regard these substances, from these observations, in any way as antiseptics for the spores of bacillus anthracis would be no more justifiable than to consider weak vinegar as such. Perchloride of mercury in a solution of 1 in 300,000 is no more capable of interfering with the life and functions of the spores of bacillus anthracis than water or salt solution, for the spores may be steeped in this solution for any length of time, and yet on being transferred to a suitable medium they grow and multiply splendidly, and when inoculated into rodents they produce fatal anthrax with absolute certainty. With my friend Dr. Blyth, Medical Officer of Health for the Marylebone District in London, I have tried the action of a number of substances in common use as antiseptics, (*e.g.* Calvert's fluid, pure terebene, phenol 10 per cent., perchloride of mercury 1 per cent.) on the spores of bacillus anthracis, exposing these in comparatively large quantities of the above fluids (the two being well mixed) for twenty-four hours, and then inoculating guinea-pigs with them (spores and antiseptic). The animals died with symptoms of typical anthrax, the blood teeming with the bacillus anthracis.

These substances then are no more antiseptics, and still less germicides, for the spores of bacillus anthracis than water is.

In all these enquiries, particularly in those upon pathogenic organisms capable of forming spores, the influence of the substances must be judged not merely by their action on the organisms, but also on the spores; for, in this very case of the bacillus anthracis, the bacilli taken from the blood of an animal dead of anthrax are killed after an exposure of say ten minutes to a solution of phenyl-propionic acid of the strength of 1 in 400, or even 1 in 800, whereas the spores of the bacilli (produced in artificial cultures) withstand completely exposure to this acid of any strength and for any length of time.

It is not my object to pass here in review all that has been done in this interesting field of research, important because of its obviously great practical importance. The work hitherto done has been enormous, but, I fear, of less utility than at first sight appears, for in most of it the point most prominent in the mind of the worker was to ascertain whether the particular

antiseptic, mixed with the nourishing medium in a solution of definite strength, has or has not the power of inhibiting the growth of the micro-organisms. This point no doubt is of some interest, and perhaps of great interest, but whether a particular substance is an antiseptic in the proper sense of the word, *i.e.*, whether on exposing the organisms to this substance in a solution of definite strength and for a definite period, the organisms become afterwards incapacitated from growing or multiplying; or still more, whether or not the substance is a germicide, *i.e.* is capable of altogether annihilating the life of the organisms; these are questions which require special attention, and represent a wide and rich field of enquiry; but, so far as I can see, it has received only in very few instances due attention.

TRAUMATIC TETANUS TREATED WITH ESERINE AND LOCAL WARMTH AND MOISTURE.

BY G. H. BRANDT, M.D.

Royat-les-Bains.

M. C., cook, age 23, of rather delicate constitution, and nervous temperament, whilst cleaning a fresh turbot cut the tip of the left thumb. The wound was deep, and bled very profusely. He wrapped a piece of rag round it, and had it dressed by me seven or eight hours after the accident. Having adjusted the flaps and then put on a series of adhesive straps so as to seal up the wound, I covered the whole with a bandage soaked in carbolised oil, and kept his arm in a sling. The bandage was constantly kept soaked with the carbolised oil. Three days after, the dressing was renewed, the wound doing well; at the end of a week the wound was healed. On the tenth day after the accident he caught a severe cold from exposure. He complained of pains all over his body with slight fever; kept his bed, and was ordered salicylate of soda, and to be wrapped up in flannel. Gradually the muscles of the legs, back, chest, throat, and the masseters, became stiff, and he could barely open his mouth. This was accompanied by profuse perspiration; no appreciable fever; pulse regular, but small. Rigidity rapidly increased; the jaws could only be separated one-eighth of an inch; there was great restlessness and insomnia. I stopped the salicylate, and gave bromide of potassium and chloral in gramme doses during the day, and hypodermic injection of morphia at night. This treatment succeeded in procuring a quiet night, but

during the day-time rigidity was great. On percussing his back the muscles felt like boards, and forcible movements produced convulsions; at times convulsions would set in without his being touched. Auscultation revealed no abnormal sounds; his breathing began to get short from constriction of the chest muscles. There was also constipation, so at this period I gave an aloetic purge, which freed the bowel, and injected per rectum four ounces of infusion of valerian, with musk and camphor. This enema was retained for six hours without producing any relief. Convulsions became more frequent and violent, rigidity increased in the legs and throat; there was great pain over lumbar region, considerable restlessness and profuse sweating. The bromide with chloral and morphia at night failing to produce any relaxation of muscles, I decided on injecting hypodermically the sulphate of eserine, and putting on an ice-bag along the spine. I began by injecting one milligramme of the sulphate of eserine every hour, watching it carefully. At the end of seven injections, finding no relaxation of the lower extremities, I gave two more injections, each containing two milligrammes, with an hour's interval between each. The patient dreaded the restlessness of the night, and begged for his morphia, which I gave him (half a grain hypodermically) at 11 P.M.

Having read somewhere that the tetanic condition might depend on a loop of the nerve being caught and nipped in the cicatrix of the healed wound, I decided on cutting down above the wound so as to cut off all communication between the cicatrix and the spine, but both patient and family strongly objected. The very idea of such a slight operation produced several convulsions. I therefore thought the next best thing to do was to relieve pressure on the nerve by relaxing the tissues, keeping them constantly in a vapour bath, which I attained by wrapping up the thumb in hot wet cloths covered over with oil-silk. The next day the patient was slightly better, but still very rigid. As the subcutaneous injections were badly supported, I gave the eserine by the mouth in centigramme doses every two hours during the day, continuing the ice-bag to the spine, and morphia hypodermically at night. Improvement gradually showed itself, which encouraged me in the administration of the paralysing drug, which was followed out

for three days, gradually increasing the space of time between each dose. At the end of the third day the improvement was as follows: less sweating, less rigidity, better nights; during all this time his powers of deglutition were good. His diet consisted of fresh milk and strong beef broth. I stopped the Calabar bean and began with the bromide three times a day, with a mild injection of morphia at night. It is now twenty-five days since the rigidity commenced; he is now convalescent, and only complains of slight stiffness, with pains in the groins and lumbar region. He is now taking warm douches and small doses of iodide of potassium.

I cannot help thinking that the relaxation of the cicatrix by the action of the hot water vapour, had some effect in the improvement, and I regret not having made an incision earlier, and without the patient's knowledge.

When convulsions occurred, chloroform inhalations certainly did good in cutting them short, and the patient admits that the ice-bag did him much good. His mental faculties were, during the whole time, quite normal. The relaxation of rigidity began in the legs.

A CONTRIBUTION TO THE STUDY OF DISINFECTANTS.[1]

BY W. J. MILLER, M.D.,

Dundee.

(*Continued from* p. 197.)

Chlorine has been long employed with confidence for disinfecting purposes, and experiments with vaccine and virus of infective inflammation establish its reliability. Braidwood and Vacher found that a mixture of equal parts of vaccine and Liquor Chlori (B.P.), applied on a heifer at twelve spots was entirely abortive, the animal being afterwards vaccinated successfully. Lymph was also rendered inert by exposure all night under a glass shade to chlorine fumes; but unless the chlorine was present in sufficient quantity to render the lymph acid, it had no effect. Dr. Baxter confirms this observation, and states that thirty minutes' exposure to the gas was sufficient; shorter exposures (five, ten, and fifteen minutes) appeared to impair the lymph, but did not destroy it. He found it equally powerful against the virus of infective inflammation in two experiments, the germicide being present in the proportion of ·1563 and ·078 per cent. respectively. The same virus undisinfected proved fatal in forty-eight hours (Medical Off. Report, p. 236). As with other disinfectants, a much weaker solution than vaccine required, sufficed to render septic microzymes barren (p. 249), and it was observed that its action was much hindered when the organisms were surrounded by an albuminous medium. Dr. Dougal has also proved the complete efficacy of this agent to destroy vaccine when the lymph was rendered acid.

Chlorine is, therefore, a reliable disinfectant, but its practical application is attended with considerable inconvenience.

[1] Read at the Annual Meeting of the Forfarshire Medical Association, July 3rd, 1884.

A very extensive use has been made of potassic permanganate, in the form of Condy's fluid, and mostly in a very futile manner. Braidwood and Vacher working with Liq. pot. permang. (B.P.), the strength of which is 1 in 120, half the strength of Condy's fluid, mixed in equal proportion with vaccine, got doubtful results. They inoculated three heifers at twelve points each (Report p. 28, *Brit. Med. Journ.* 1876, vol. ii.), with a mixture in equal proportions of this disinfectant and vaccine. In one, disinfection was complete, subsequent vaccination succeeding; in another the inoculation was also barren, but so also was subsequent vaccination with good lymph; the outcome of the third was doubtful, the result of the twelve insertions being one crust, and six "probable vesicles," and a subsequent vaccination was also doubtful, yielding one vesicle for six insertions.

On the human subject the same writers obtained results (Rep. p. 46, *British Med. Journ.* 1877, vol. i.), which I have tabulated as follows:—

		Proportion of Disinfectant.	Time of action before use.	Result.
1	Child.	2 drops to 1 tube of vaccine.	30 hours.	2 groups of vesicles at the 2 points inoculated.
2	Adult.	Ditto.	54 hours.	Vaccination a failure. But subsequent vaccination also failed.
3	Child.	Ditto.	4 days.	3 groups of vesicles for the three scratches.
4	,,	Ditto.	Used immediately.	3 scratches—vaccination a failure—subsequent vaccination successful.
5	,,	1 drop to 1 tube of lymph.	(Probably the same but not stated.)	3 points. Vaccination a failure. Subsequent vaccination successful.
6	,,	Ditto.	Used immediately.	3 points. One typical group of vesicles.
7	,,	Ditto.	Ditto.	3 points. Vaccination a failure. Subsequent vaccination successful.
8	,,	2 drops to 1 tube of vaccine.	Ditto.	3 points. Vaccination a failure. Subsequent vaccination successful.
9	,,	Ditto.	Ditto.	3 points. Vaccination a failure. Subsequent vaccination successful.

Their inference from these experiments is, "that Liquor potassæ permanganatis (B.P.) affects the contagious property of vaccine lymph; and that it does so at once like chlorine and sulphurous

acid"; such is the case in five of the nine experiments, but the conclusion seems a little misleading when it is said, "like chlorine and sulphurous acid," because in numbers one, three, and six, the lymph was by no means barren (see table), while in number two, seeing a subsequent vaccination also failed, the subject was perhaps insusceptible.

The conclusion I would draw is, that this germicide is not certain in its effect, especially considering that in numbers one and three in which it produced good vesicles, it had exerted its action for thirty hours and four days respectively, and in the proportion of two of the germicide to one of lymph, a quantity of disinfectant quite inapplicable in practice. Dr. Baxter (Report, &c., p. 224), in three experiments, found that potassium permanganate when present in the proportion of ·5 per cent. rendered vaccine inert, this strength corresponding to about one part of Condy's fluid to rather more than two parts of lymph, but it is not stated how long before use the mixture was made; and in four experiments with the disinfectant present in the proportion of ·1 per cent. and less, the lymph appeared to be unimpaired, and this is a comparatively strong solution, Condy's fluid being 1 in 60 or 1·66 per cent. He succeeded in destroying the virus of infective inflammation when the permanganate was present in the proportion of ·05 per cent. or more; a very much weaker proportion even than that which was found impotent against vaccine. A smaller proportion even than this (·02 per cent.) was ascertained by Davaine to be sufficient to kill the virus of malignant pustule (Baxter's Report, p. 237). And a still smaller proportion (·0079 per cent.), was effectual in Baxter's experiments to arrest the development of septic microzymes. In order to test how far the action of this germicide was impaired by the contagium particles being presented to it in an albuminous medium, he made six experiments (p. 252). A guinea-pig inoculated with the washed virus, undisinfected, died five days thereafter, while two others inoculated with the same virus with permanganate added in the proportion of ·05 and ·025 per cent. exhibited no symptoms. A fourth animal inoculated with unwashed virus (albumin not removed) died four days thereafter, and two others inoculated with the same preparation mixed with permanganate in

the proportion which had been found completely to annul its poisonous action when washed free of albumin, likewise died. This conclusively demonstrates the protective property of the albuminous medium against this germicide, and it is a very important point, seeing that contagia as we have to deal with them are probably always so protected. Dr. Baxter says, in summing up his results (Report, &c., p. 254), "that there is no security for the effectual fulfilment of disinfection short of the presence of . . . . . undecomposed permanganate in the liquid after all chemical action has had time to subside." Considering this fact with reference to the quantity of Condy's fluid required, and its cost, Dr. Dougal made an experiment from which he concluded that "one fluid ounce of enteric fæces deoxidised not less than ten ounces of Condy's fluid, and one ounce of the patient's urine deoxidised two ounces." "Supposing that a typhoid patient pass twelve ounces of fæcal matter, and twenty ounces of urine during each twenty-four hours—say for a week—which, it will be conceded, are not excessive quantities; and supposing that Condy's fluid sold to the public in 8 oz. bottles at 1*s.* each is used, it follows that 280 ounces of Condy's fluid are required to oxidise or disinfect the week's urine, which at 1*s.* per 8 oz. amounts to £1 15*s.*; and that 840 ounces are required to oxidise or disinfect the week's fæces, which at 1*s.* per 8 ounces, amounts to £5 5*s.*, in all £7 per week" (*Brit. Med. Journ.* 1879, vol. ii. p. 726).

On taking a general view of the results of these observations by various authorities, especially the strength in which this agent must be used, and its cost, one is driven to the conclusion that although it does possess considerable disinfectant power, it is not of the value which is generally attached to it; and that, as usually employed, it is probably useless. As a deodorant, however, when it can entirely cover the offensive matter, it is of great value in the sick room.

Hydrochloric acid is not generally in use as a disinfectant, yet it is one of very certain efficacy, and Dr. Dougal's experiments have led him to rely on it for the disinfection of bed and body clothes, and of fæcal matters. Tested on vaccine he found that lymph exposed to its vapour for twenty-four hours was

rendered inert (*Glasgow Med. Journ.* vol. v. 166). Braidwood and Vacher also conclusively established its potency (3rd Report, *Brit. Med. Journ.* 1882, vol. i. p. 42). Hydrochloric acid gas was collected in a jar, into which was placed vaccine lymph on slips of glass for varying periods, some for four days, one for two days, four for one day, and one for two hours. Altogether twenty-four tubes were employed, three points of insertion being made on each of eight subjects, and every insertion failed. These subjects were all afterwards vaccinated with success except two, in whom it succeeded on another trial. For vaccine lymph therefore this agent is a certain disinfectant.

Acetic acid has very strong claims to our attention. Setting aside the long established use of vinegar in the sick room as scarcely of the nature of scientific proof, it yet appears that the belief of our great grandmothers, and their great grandmothers before them, had a sound scientific basis to rest upon. Dr. Dougal completely destroyed the infectivity of vaccine lymph by exposing it for twenty-four hours to the vapour of glacial acetic acid (*Glasgow Med. Journ.* 1872, vol. v. p. 166 and 168).

With the assistance of my friends I am enabled to give the result of twenty observations with this agent. Fourteen experiments were made with diluted glacial acetic acid. In six the dilution employed was 1 in 24, and this was mixed with the lymph immediately before use. This solution is not so strong as British vinegar. In one of these, the lymph was mixed with the acid solution slightly in excess, and was barren. In the other five the lymph and the acid solution were in equal proportions, the results being, that in one the lymph was unimpaired, in two the vesicles were imperfect, and in two, disinfection was complete. The other eight experiments were with the acid diluted to 1 in 12, this solution being mixed in equal proportions with vaccine. In five of these, the mixture with lymph was made immediately before it was used, and in all the disinfection was complete. The twelfth and thirteenth experiments were a stronger test, the lymph being first applied, and immediately thereafter about an equal quantity of the 1 in 12 solution, and in one of these also the lymph totally failed to infect, but in the other was unimpaired. In the fourteenth experiment the lymph was applied sixty

seconds before the germicide, and the lymph produced a good vesicle.

Eight experiments were made with an aromatic acetic acid. Dr. Dougal strongly recommends Rimmel's vinegar as a disinfectant for sponging the body of scarlatinal patients, but its expense puts it beyond the reach of the many. Accordingly I had an aromatic acid prepared some years ago, in which cheaper aromatic oils are employed, and although the product is certainly not quite so agreeable, it is yet sufficiently so, and is of so moderate a price as to be within the reach of all. The proportion of glacial acid in this preparation is a little over sixty per cent. With this as a disinfectant I made eight observations. In one with the dilution 1 in 40 and vaccine in equal proportions, mixed for six and a half hours, the lymph was uninjured. In another all the insertions failed, showing that the lymph was at fault. In four I employed a dilution of 1 in 20 mixed with lymph in equal proportions; in one of these, the mixture having been made twenty-six hours before use, disinfection was partial; in two, the mixture having stood a few hours, and twenty-eight hours respectively, disinfection was complete; and in one, after two hours and twenty-three minutes the lymph was still effective. In two, the lymph was mixed immediately before use with a solution of 1 in 10, and in both it was barren.

Five experiments were made with Rimmel's vinegar, mixed with vaccine in equal proportions. It was observed that this mixture became opaque, the lymph apparently coagulating, In one experiment the mixture was made one and three quarters of an hour before use, in another two hours, and in the third it was made immediately before use. In all three the lymph was barren. In two the lymph was first rubbed in, then a little of the vinegar, and in these the vesicles were very imperfect, and later than the insertions with pure lymph in developing. It appears therefore that we have in acetic acid, a ready, safe, efficient and cheap disinfectant: and that a solution of the aromatic acid or glacial acetic acid, (1 in 20) would probably be as efficient a disinfectant as any other for the hands of the surgeon or accoucheur, and a bottle of aromatic vinegar on his toilet table, if habitually used, is something more than merely ornamental. As a passing suggestion I may remark that the success of the 1 in

12 dilution in arresting the infection of vaccine even when it was applied after the pure lymph, has led me to conjecture whether it is perhaps possible that in cases of dog-bite it might hold out any prospect of success to wash or syringe the wounds freely with vinegar. We are all familiar with the note in reported cases of hydrophobia, that the wounds had been freely cauterised with nitrate of silver, but as the result showed, to no purpose; and we also frequently see how this treatment converts a slight innocent wound into a very troublesome one. Vinegar is almost always at hand, and could be fearlessly used by any one.

Another much advertised disinfectant is sanitas, and seeing it is much employed by the sanitary authority in Dundee, I have thought it desirable to test its power on vaccine. Three observations were made with the vapour in the following manner. A two-and-a-half-ounce wide-mouthed bottle was filled with sanitas powder to within about three-quarters of an inch from the stopper, and about half a tube of lymph having been placed on a microscope cover-glass, this was fixed edgeways into a slit in the cork, so that the lymph was exposed to the action of a very concentrated vapour. One specimen was thus exposed for twenty-two hours, another two days, and a third seven and a half days, with the result that the infectivity of the lymph was not in the least impaired. Eight observations were made with sanitas fluid No. 1. One with two parts of lymph and one part of sanitas fluid mixed immediately before use, and three others with the lymph and the disinfectant in equal proportions mixed respectively two and a half, four and a half and five hours before use, yielded the same negative result. But in four other experiments, in which the mixture, also in equal proportions, was not employed till it had stood eight hours, twelve hours, thirty-one and a half hours, and seven days respectively, the disinfection was complete. This agent has therefore some disinfectant power, but considering the large proportion of the fluid employed, namely equal parts of germicide and lymph, and its complete failure even in this strength after being mixed for five hours, and further, the absence of any effect from the concentrated vapour after even seven and a half days exposure, it is in my opinion highly probable that its utility for disinfecting a fever apartment is a vain dream, and that the money expended

upon sanitas here for this purpose is absolutely thrown away.[1]

Perchloride of mercury has recently come into use as a disinfectant employed in solution of the strength of 1 in 2,000. I have made fourteen observations with this agent on vaccine. In one of these it was tested in the following manner. I placed half the contents of a well-filled tube on a glass slide, and after it had quite dried covered it with some perchloride solution (1 in 1,000), and after allowing it to lie for ten minutes, washed off the perchloride gently with water, so that the film of vaccine remained; this was then rubbed up with water and put in a tube for use. The product entirely failed to take, while the other half of the same specimen of lymph produced a good result. Another specimen was mixed with an equal quantity of the same solution (1 in 1,000) and was used an hour thereafter, disinfection being complete. Two trials were made with the same mixture, made immediately before use, two after an interval of three minutes, and one after fifteen minutes, and in all five the lymph was uninjured. Five experiments were made with a solution 1 in 500, and vaccine in equal proportions, mixed respectively, immediately before use, a few minutes, three minutes, three minutes, and five minutes, and in all the lymph was in no way affected. Two observations with lymph and a still stronger solution, 1 in 250, in equal proportions, mixed immediately before use, gave the same negative result. This is a strong solution, nearly two grains to the ounce, eight times the strength which is recommended for use. This agent is, therefore decidedly inferior in energy to several disinfectants which have been discussed. As however it has been seen that the virus of infective inflammation is destroyed by considerably weaker dilutions of a disinfectant than vaccine, and considering the weight of authority by which the perchloride has been introduced, I will not presume on the strength of these experiments to throw doubt on its value in obstetrical and surgical practice.

Observing in the *British Medical Journal* (April 26th, 1884,

[1] I would like to say that my friend Dr. Anderson is not responsible for the introduction of this agent, it having been in use before he entered on his appointment as Medical Officer of Health.

p. 800) a remark by Mr. G. Pollock on chromic acid, that, employed in solution 1 in 2,000 to 4,000 of water, it "destroys all smell of disagreeable or offensive discharges at once on application," and "as a disinfectant nothing, I believe, can surpass it," I procured four observations with it, but unfortunately in two all the insertions failed from inefficient lymph or insusceptibility. A third with lymph and solution (1 in 2,000) in equal proportions showed the lymph unaffected; in the fourth, however, with a solution (1 in 1,000) it was barren.

Eight observations were made with creasote. In one I employed a solution 1 in 480 mixed two and a half hours, and in another 1 in 500 mixed eighteen hours before use, the lymph being in equal proportion, but in neither was there any evidence of disinfection. Having in view its use in the form of vapour for disinfection of apartments, and more especially its use for inhalation in pulmonary disease, six experiments were made in the same manner as has been described when discussing sanitas. One specimen of lymph exposed for three hours to air saturated with the vapour kept its infective power unimpaired, but two other specimens exposed for twenty-four hours and eight days respectively were barren. In the other three of these six observations, the experiment was varied with the view of ascertaining whether it might be with creasote as is alleged by Dr. Dougal to be the case with carbolic acid, the lymph being exposed to air saturated with the vapour for seven days, and then exposed for sixteen days, but in none of the three did the lymph recover its infective power.

Four observations were made with eucalyptus oil, two of which, however, proved useless, all the insertions failing; in one of the others lymph exposed four hours to air saturated with the vapour retained its potency, but in the fourth ten hours' exposure rendered it barren.

A very short reference must suffice for experiments by Braidwood and Vacher with some other substances which are employed as germicides. Cupralum in concentrated solution immediately destroys vaccine (Report, p. 46, *Brit. Med. Journ.* 1877, vol. i.); Ferralum and Terebene appear to have the same power. Seven days' exposure to air saturated with the vapour

of camphor killed vaccine; four days failed to do so (p. 82). Chloralum is uncertain, inoculation of a calf with a mixture of this agent and vaccine in equal proportions yielding six good and six doubtful vesicles (Report, p. 28, *Brit. Med. Journ.* 1876, vol. ii.). Boracic acid had little effect on lymph, forty characteristic groups of vesicles being obtained for sixty-nine insertions, using a mixture with this germicide in saturated solution; and one of the experiments being with a mixture of two drops of the solution with one tube of vaccine preserved in tubes for eight days (Report, p. 45, *Brit. Med. Journ.* 1877, vol. i.). Salicylic acid in saturated solution appeared to have little or no effect, because although in two experiments the vaccination was abortive, it succeeded in several others, one of which was with a mixture in the proportion of four drops of the solution to two tubes of lymph kept for eight days, three insertions yielding two well-formed groups of vesicles (Report, p. 45). Davaine found iodine the most certain disinfectant for the virus of malignant pustule (Med. Off. Rep. p. 251).

Perhaps the first reflection to arise in connexion with these experiments is this, whether the ascertained effect of a germicide on vaccine lymph is a reliable basis for an opinion as to its value for other contagia. It appears to me that it is. Because, not only has it not been found that any disinfectant possessing a destructive power against vaccine failed to destroy other contagia operated on, but on the contrary, these latter lost their infective power under the action of weaker dilutions. For example, while vaccine was not impaired by carbolic acid in the proportion of 1 per cent. and 1 to 2 per cent. was uncertain, a 1 per cent. solution destroyed the virus of infective inflammation and of malignant pustule. Glanders however required like vaccine 2 per cent. Again, permanganate of potassium in the proportion of ·1 per cent. had no effect on vaccine, but was sufficient in the proportion of ·05 per cent. for the virus of infective inflammation, and ·02 per cent. for malignant pustule. An interesting observation by Dr. Baxter must be referred to, because it is not in accordance with what might have been expected, namely, that the intensity of the virulence of a contagium is not a measure of the degree of its resistance to the action of disinfectants. Treating of the

virus of infective inflammation, he says: "The material employed had thus passed now through one, now through several generations of animals, and though, as is well known, the virulence of the latter is much more intense than that of the former, it was not observed that there was any difference between them as regards their susceptibility to the action of disinfectants." (Med. Off. Report, &c. p. 230).

This paper has reached such a length that I will conclude with only a few observations put as concisely as possible.

(1.) Considering the strength of a disinfectant which these experiments show to be necessary, it is very doubtful that any efficient disinfection of a room can be practised while it is occupied. Nevertheless, it is possible that the presence of a disinfectant, though not in sufficient concentration to kill contagium, may by long continuance of operation weaken it, and if microzymes be the contagium, may so lower their vitality as to impair their power to reproduce their kind. A certain degree of probability is given to this by Prof. Tyndal's observation of the effect of discontinuous heating in sterilising putrescible liquids, which led him to conclude that there is a period in the life history of these minute organisms when they are especially vulnerable. It is therefore in the direction of good, to employ some disinfectant during the progress of the case, and there is none equal, either in efficiency or in simplicity of application, to sulphur. It is exceedingly convenient in practice to use sulphur pastilles, as introduced by Dr. Littlejohn, each of which contains twenty-five grains of sulphur, one or two being used at a time, according to the size of the room. This should be done several times a day.

(2.) The skin of the patient should be sponged several times a day with diluted acetic acid, by preference with the aromatic. This is especially applicable in scarlet fever, effectively disinfecting the desquamating skin. I only mention the method of inunction to emphatically condemn it. The strength of the solution must be regulated by what is found agreeable to the patient, a 1 to 20 solution of the aromatic acid which has been referred to, is generally not too strong.

(3.) For the final disinfection of the sick room nothing equals sulphur. But it must be thoroughly applied. The Dundee

sanitary authority uses about three pounds of sulphur to a room about ten feet square, carefully closing all apertures by which the fumes might escape, and leaving the room shut up for about four hours.

(4.) For disinfection of clothing &c. the method followed here is exposure to a temperature of about 250° for three hours in a specially constructed chamber, the air being also charged with the fumes of about six pounds of sulphur. It is scarcely possible that any contagium can live through such an ordeal.

(5.) Excreta of patients are best dealt with by Dr. Dougal's method, namely, mixture with hydrochloric acid diluted to 1 to 20. He has proved that this solution does not injure the metal fittings with which it comes for so short a time in contact. Clothes may also be thoroughly disinfected by this agent, and without injury.[1]

(6.) For hand disinfection, carbolic solution 1 in 20, acetic acid, and sulphurous acid are almost certainly thoroughly effective.

(7.) The question of disinfectant inhalations for lung disease, especially phthisis, demands a longer consideration than can here be given to it, but when we consider that vaccine which had been exposed for three hours to air saturated with creasote vapour, and similarly for four hours to the vapour of eucalyptus, retained its infectivity unimpaired, that the germs to be acted on are far in the recesses of the air vesicles, and that the inhaled disinfectant can only reach them in very weak dilution, if indeed it reaches them at all, it appears to me, although it is very disappointing to arrive at such a conclusion, difficult to place much confidence in this therapeutical expedient.

[1] For details of his method and his experiments proving absence of injury to fittings, see *Brit. Med. Journ.* 1879, vol. ii. p. 771.

SPASMODIC DYSMENORRHŒA AND STERILITY.

BY E. L. DIXON, M.D., M.R.C.P.

A LADY, aged 30, consulted me in February 1882 on account of spasmodic dysmenorrhœa, with the exception of which she was quite well; she was robust and not of nervous temperament. The catamenia came on at fourteen, and had since been regular; the discharge had been slight, not membranous, had lasted for four or five days, and had always been accompanied with very severe spasmodic pain in the hips and back; there had been no leucorrhœa in the intervals. Her mother had dysmenorrhœa, but her sister had not. Married more than three years, she had never been pregnant. She had been treated for neuralgia, for gout, and in various ways; and had taken much medicine. Afraid of becoming addicted to them, she had given up opium and alcohol, which she had found of use; and indeed she had long left off the use of drugs. She said she was willing to undergo any operation which afforded any probability of relief.

On vaginal examination, the os and cervix uteri, though perhaps rather small, appeared perfectly healthy, exhibiting not the smallest abrasion; the uterine sound could be passed, with some little difficulty and pain, in the normal direction and to the normal length.

On February 20, a fortnight after the catamenia, a No. 6, heavy metallic, slightly-curved uterine sound (Weiss), previously well warmed with hot water, and anointed with carbolic oil (1—20), was passed through the internal os, and retained till all pain had disappeared. On the 21st No. 8 was passed, and retained as the day before. On the 22nd even No. 6 could not with moderate force be introduced through the os internum, and when with-

drawn it was found coated with pus. On the 23rd I failed again to pass No. 6.

March 13, 1882.—The last catamenial period, of which the last day was the 11th, was very much less painful than usual; and she expressed herself as very grateful for the relief already afforded her. No. 6 sound was comparatively easily passed, and No. 8 with great difficulty, having been pushed gently and firmly onwards. On the 14th Nos. 8, 10, and 12 were introduced, No. 10 being allowed to remain in a quarter of an hour, till the pain was nearly gone, and No. 12 being left in for half an hour. On the 15th No. 12 was passed, and kept in ten minutes, and No. 14 was passed (through the internal os) with a good deal of pain, which, however, soon diminished. It was allowed to remain half an hour, and when withdrawn was not coated with either pus or blood. The treatment was now suspended.

April 17, 1883.—She was delivered of a fine male child after a labour of twenty-nine hours. She said that the pains of the first stage were no worse than those of her old dysmenorrhœa. After the treatment by sounds the catamenia had continued to be accompanied with very much less pain than before, though not entirely free from it.

This case is, I think, a good example of the treatment of spasmodic dysmenorrhœa by dilatation. No disease of the uterus could be detected on examination, nor was there any marked stenosis of the internal os. The external admitted the largest sound with facility. It was one of the simple cases described by Dr. Matthews Duncan, who has so strongly advocated this method of treatment in opposition to division of the cervix, which is a more formidable procedure. The great relief afforded may perhaps be explained by the over-dilatation to which the os internum is subjected, which impairs the spasmodic power of the transverse muscular fibres, or by the catarrhal inflammation which is set up, as in this case, where pus was found upon the instrument. As will be seen, the dilatation was carried out in the manner recommended by Dr. Matthews Duncan,[1] and not in the manner of Dr. Godson.[2]

[1] *Clinical Lectures on Diseases of Women.*

[2] *Lancet,* 31st December, 1881.

ON THE ALTERATIONS IN THE ACTION OF DIGITALIS PRODUCED BY FEBRILE TEMPERATURE.

BY T. LAUDER BRUNTON, M.D., F.R.S., AND J. THEODORE CASH, M.D.

It not unfrequently happens that the physician who prescribes some powerful medicine in order to relieve the diseased condition in his patient is disappointed in the expectation he has formed, and finds that the exhibition of the medicine in disease is not followed by the result which he has been led to expect by the action of the drug on healthy animals or on healthy men. Digitalis is a marked example of this kind of drug. When given to animals or to healthy men it slows the pulse often to a very considerable extent. When given in pneumonia it was found by Thomas [1] to have but little action on the pulse before and up to the crisis of the disease. The curves of pulse and temperature obtained from patients treated with digitalis were almost the same as from those who were subjected to a purely expectant treatment. In some cases the pulse alone was distinctly affected, in a few the pulse and temperature both fell slightly, and occasionally they conformed to the rules laid down by Wunderlich regarding the action of digitalis in typhoid fever.[2]

[1] Thomas, *Archiv. d. Heilk*, 1884, v. pp. 30 and 167.

[2] Wunderlich, "Medical Thermometry," *Sydenham Society's Translation*, p. 324. These rules are that digitalis in the quantity of two to four grammes (ʒss – ʒj nearly), or even more (in divided doses extending over from three to five days), given in the second and third week of a severe case of typhoid, immediately produces a slight moderation of temperature in a great number of instances, or perhaps a considerable fall of temperature, which during the time of the exacerbation may amount to 2° C. or more (3·6° F.). This fall does not generally last more than about a day after the exhibition of the remedy. Then the temperature

Generally the action of digitalis first became perceptible after the crisis of the pneumonia was passed. It was then evidenced by an abnormally low temperature and pulse-rate which was much more usually observed when digitalis had been given, than when a purely expectant system of treatment had been followed. Wunderlich's observations agree with those of Thomas in this respect, that he found digitalis slowed the pulse markedly in typhoid when the fever was moderate.

An attempt to ascertain the reason why digitalis does not slow the pulse in pneumonia, at least while the disease is at or near its height, was made several years ago by one of us.[1]

The absence of any slowing action of digitalis upon the pulse might be due to one of several causes. It might, for example, be due to paralysis of that part of the nervous system which in a condition of health usually restrains the cardiac beats, and prevents the pulse from becoming too rapid. Or it might be due to stimulation of the heart itself or its accelerating nerves, quickening the pulse in spite of the restraining action of the controlling or inhibitory mechanism.

Without entering more minutely into the nature of this controlling or inhibitory mechanism, we may broadly divide it into two parts, central and peripheral. The central portion is that part of the medulla oblongata from which the vagus roots spring; the peripheral part consists of the termination of the inhibitory fibres of the vagus in the heart.

It is evident that if the peripheral endings are paralysed, the power of the medullary vagus-centre to restrain the heart will be as completely destroyed as that of a rider to rein in his horse when the bit has fallen from its mouth. But the inhibitory mechanism may be paralysed centrally as well as peripherally. The controlling nervous mechanism in the medulla may become inactive and exercise no restraining action upon the heart, although the vagus fibres are still unaffected, and are able to produce slowness of the pulse or even actual stoppage

rises again, and in cases favourably affected does not again attain the previous height, but remains stationary, with very powerfully-depressed pulse, at moderate heights, whilst defervescence takes place as usual, and the pulse first recovers itself from its artificial retardation about four days after the use of the digitalis, whilst convalescence has meanwhile advanced.

[1] Brunton, *St. Bartholomew's Hospital Reports*, 1871, vol. vii. p. 216.

of the heart whenever they are stimulated. The accelerating mechanism of the heart may, like the inhibitory, be divided into central and peripheral portions. The peripheral part is located in the heart itself, and is closely associated, if not indeed identical with, the motor-ganglia by which the cardiac pulsations are maintained. When the frog's heart after isolation from the body is warmed artificially it begins to pulsate more and more rapidly as the temperature rises, until finally the pulsations become indistinct and vermicular, and the heart stands still in a state of complete contraction or heat-rigor, as it is called.

The exact position of the accelerating centre of the heart in the brain or spinal cord has not been accurately ascertained; the accelerating impulses, however, pass by the sympathetic filaments which usually accompany the vertebral artery and pass from the lowest cervical ganglia to the heart. We have then, roughly speaking, four pieces of nervous mechanism to consider: (1) vagus roots, (2) vagus ends, (3) sympathetic roots, (4) cardiac ganglia.

We have to ascertain, if possible, what the alterations in one or more of those structures are which deprive digitalis of its power to slow the pulse in patients suffering from pneumonia. As pneumonia is a disease in which the temperature rises high, the first idea which occurs to us is, that the presence of the pyrexia itself is the reason why the drug does not act as in health, or as it does in cases of typhoid fever when the temperature elevation is moderate, as observed by Wunderlich.

We have therefore attempted as a first step in our investigation to ascertain the effect of rise of temperature alone on the pulse in the cat, which animal we employed in the present research. In a former series of experiments made by one of us[1] on the effect of heat upon the pulse in the rabbit, it was found that the pulse-rate increased with considerable regularity as the temperature of the body rose, as is shown by the following experiments in one of which the vagi were uncut and in others were cut. At the commencement of the experiment there were slight irregularities before, which have not been copied here. After the temperature had risen above a point which is marked by thick type in the table, the pulse-rate began to fall.

[1] Brunton, *op. cit.*

Rabbit Vagi Uncut.

Temp.	Pulse in 15″.
37°·7 (100°F.)	71
38°·3 (101°F.)	73
38°·8 (102°F.)	76
39°·4 (103°F.)	77
40°· (104°·2F.)	82
40°·5 (105°F.)	85
41°·1 (106°F.)	89
41°·6 (107°F.)	91
42°·2 (108°F.)	94
42°·7 (109°F.)	96
43°·3 (110°F.)	97
43°·8 (111°F.)	**102**
44°·1 (111°.5F.)	102
44°·1 (111°·5F.)	37

Rabbit both Vagi Cut.

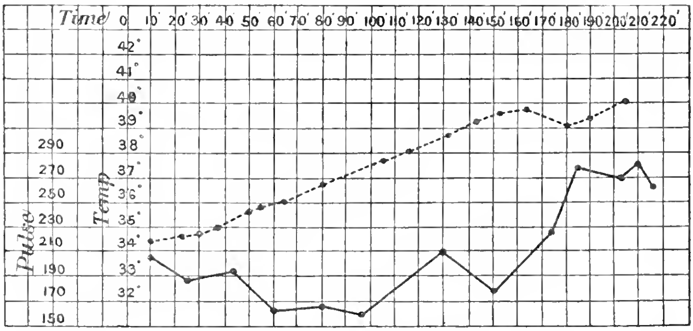
Temp.	Pulse in 15″
39°·1 (102°·4F.)	83
39°·4 (103°F.)	84
40° (104°F.)	87
40°·5 (105°F.)	91
41°·1 (106°F.)	91
41°·6 (107°F.)	97
42°·2 (108°F.)	101
43°·5 (110°·3F.)	**110**
43°·8 (111°F.)	108
44° (112°F.)	109
45° (113°F.)	90
45°·1 (113°·2F.)	35
45 ·2 (113 ·5F.)	18
45 ·4 (113 ·8F.)	10

In experiments of the same kind which we have made upon cats, we have noticed that the pulse does not rise at first so regularly in proportion to the temperature as it does in the rabbit, but on the contrary may remain only a little above the normal until the temperature of the body rises to a point ranging in different animals from 39° C. and 42° C. when the pulse-rate suddenly begins to rise with greater rapidity. In most of the animals examined this point is between 40°·5 C. and 42° C. although in some it may be as low as 30°·7 C. The suddenness of this rise at once suggests paralysis of the inhibitory nerves as its cause. This paralysis might be, as we have already said, either central or peripheral.

In the experiments on the rabbit already referred to, it was found that the peripheral terminations of the vagus retained their power, although weakened, up to the death of the animal, at a temperature of 45°·3 C. Peripheral paralysis of the vagus of the cat seemed therefore unlikely. The idea that the paralysis was central appeared to us more probable and agreed with what is known of the normal action of the vagus upon the heart of the cat and the rabbit. In both animals stimulation of the vagus trunk is followed by a slowing and stoppage of the pulse at least at ordinary temperatures. The nerve centre in the medulla which regulates the cardiac beats through the vagus, appears, however, to act much less powerfully as a rule in the rabbit than in the cat, so that in the rabbit the pulse is normally much quicker than in the cat, and does not rise to anything like the same extent when the influence of the vagus centre upon it is abolished by cutting across the trunks of the nerves, or

paralysing their terminations in the heart by means of atropine. This being the case we should expect that paralysis of the vagus centre in the rabbit by heat would not be marked by any sudden increase in the pulse-rate, and that we should simply find as actually occurred—that the pulse rose proportionately to the temperature from the stimulating action of heat upon the heart itself. In the cat, however, we should expect the sudden removal of the inhibitory influence normally exerted by the vagus centre to be evidenced by a rapid rise in the pulse-rate out of proportion to the rise in temperature, and this is what we have actually found.

On looking over the accompanying charts of the relationship between pulse-rate and temperature, it will be noticed that at first the pulse remains nearly at its normal, or increases slightly as we should expect from the stimulation of the cardiac ganglia by heat, but it does not rise regularly in proportion to the temperature. Then after the temperature has risen to a certain



The unbroken line shows the pulse-rate, the dotted line shows the temperature in the axilla in all the figures.

Fig. 1.—Shows the effect of rise of temperature alone. At the 195th minute both vagi were cut; the section was not followed immediately by any apparent effect. After eight minutes more, the pulse-rate rose slightly and then fell.

extent, the pulse-rate goes up with a sudden bound, suggestive as we have already said of vagus paralysis. However probable it may be that the paralysis is of central origin in the cat, it would be wrong to assume it as a certainty, more especially as both in this animal and in the rabbit the inhibitory power of the vagus trunk over the heart is diminished though not

entirely destroyed by very high temperatures. We have therefore tested the point experimentally, and it will be seen from Fig. 1. that when the temperature had risen in the axilla to 40° C. the inhibitory action of the vagus was completely abolished, so that section of both vagi produced no effect whatever in the pulse-rate. To ascertain whether or not the paralysis was central we stimulated the peripheral trunk of the vagus and found that it still retained at this time a powerful inhibitory action upon the heart though somewhat less than at the normal temperature.

We may conclude then, that the rapid rise in the pulse-rate which a high temperature occasions in the cat is chiefly of central origin, and is due to partial paralysis of the vagus centre, which is aided by a diminished action of the peripheral ends of the vagus and increased action of the cardiac ganglia.

Although the vagus centre is so much weakened by the action of the heat that it ceases to exercise any inhibitory action upon the heart, yet its functional activity is not completely destroyed even by very high temperatures. Thus we found in one case, that on dividing one vagus in a cat and stimulating the central end, the vagus centre responded to the

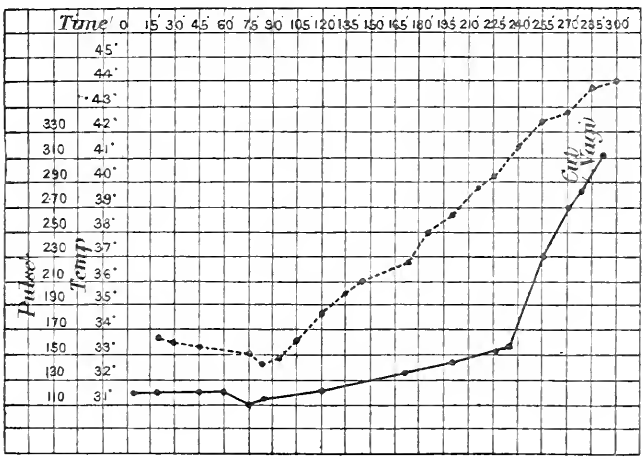


FIG. 2.—Shows the effect of rise of temperature after injection of digitalis. At the 45th minute ·75 cc. (12 minims) tincture of digitalis were injected, and another similar injection was made at the 55th minute. At the 65th minute the heating was begun.

stimulus, and we obtained through it and through the other vagus trunk which remained intact, a reflex action upon the heart, the pulse becoming distinctly slower although the temperature of the animal had risen to 46°·6 in the rectum, and 45° in the axilla, and death occurred from heat (hyperpyrexia) almost immediately afterwards.

The action of heat upon the pulse seems to be influenced to a large extent by the action of digitalis. When this drug is introduced into the circulation by the femoral vein in doses of ·25cc., twice or thrice repeated before the temperature of the animal began to be raised, the pulse-rate remains for a long time comparatively low, and did not begin to rise suddenly until a higher temperature had been reached than in the unpoisoned animal.

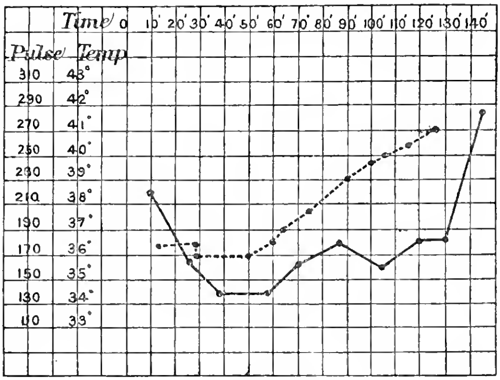


Fig. 3.—Shows the effect of rise of temperature after the administration of digitalis. At the 30th minute tincture of digitalis was injected, and warming was begun. At the 90th minute natural respiration ceased, and it had to be continued artificially.

In Figs. 2 and 3 it will be seen that the sudden rise in pulse-rate does not occur until the axillary temperature has reached 41° to 41°·5 C., as compared with 39° C. in the animal to which no drug had been administered. When given to a cat in which the temperature had already been raised artificially to 39° it reduced the pulse-rate, and prevented any sudden rise occurring although the temperature in the axilla afterwards rose to 40°·5 C. (Fig. 4). The charts which we have selected illustrate the results which we have obtained in our research, but the results

have been confirmed by other experiments which we have not thought it necessary to give in detail.

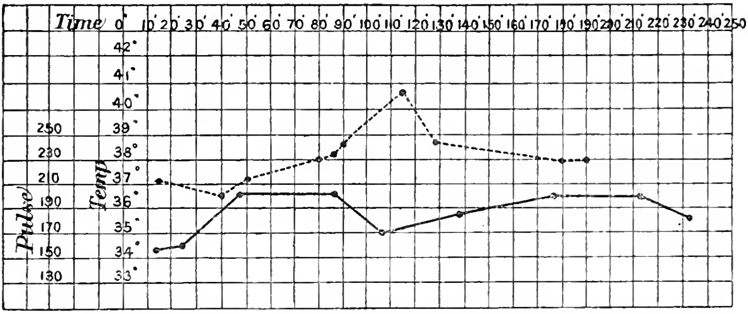


FIG. 4.—Shows the action of digitalis when given after the temperature has already risen. At the 30th minute the warning was begun; at the 100th minute ·75 cc. of tinctuie of digitalis was injected.

On testing the effect of digitalis upon an animal whose temperature had been previously raised, and was allowed to fall after the administration of the drug, we observed an effect similar to that noticed by Thomas during defervescence in pneumonia. This is illustrated by Fig. 5, where the temperature of the animal having been raised to 38°·6 in the axilla and 38°·8 in the rectum, digitalis was administered and cooling commenced.

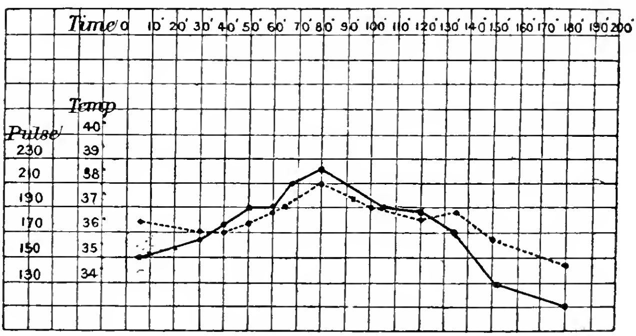


FIG. 5.—Shows the effect of digitalis given shortly before cooling. At the 25th minute warming commenced; at the 75th minute ·75 cc. tincture of digitalis was injected, and at the 80th minute cooling was commenced.

The pulse *at once began to fall* with a rapidity somewhat out of proportion to the fall of temperature, so that when the tempera-

ture had reached the normal in the axilla and rectum the pulse had fallen below its original rate. It will be noticed that the temperature both in the axilla and rectum fell considerably below the original at the end of the experiment. This might be regarded as a further correspondence between our experiments and the observations of Thomas in pneumonia, but we cannot lay any stress upon it, as the temperature of all animals tends to sink when they are kept in a position of immobility as in our experiment, even when no digitalis is given.

We may now summarise the results of our experiments on the effect of heat upon the pulse, and on the modification it produces on the action of digitalis.

In the cat and probably all animals in which the vagus centre exerts, as it does in man, a considerable restraining influence upon the pulse, rise of temperature causes at first a slight quickening of the pulse which is probably due to stimulation of the cardiac ganglia.

This quickening does not increase in such constant proportion to the temperature as it does in rabbits, in which the vagus centre normally acts but slightly upon the heart.

When the temperature rises in the cat above a certain point it weakens the action of the peripheral ends of the vagus on the heart, and also weakens the vagus centre in the medulla.

The action of heat upon those two parts of the nervous system appears to be of the same kind, but it differs in degree; the centre appearing to be more affected than the periphery, so that its inhibitory action is completely abolished at a time when the peripheral ends still retain their functional activity to a great extent.

Though the inhibitory centre in the medulla is rendered inactive by the heat so that it does not act on the heart, it is not completely paralysed, and is still able to restrain the heart when it is called into action by a powerful stimulus, such as strong galvanisation of one of its afferent nerves.

The action of digitalis upon it is that of a stimulant increasing its activity, and is very much like the effect which we should expect from gentle instead of strong stimulation from one of its afferent nerves.

The practical conclusion which results from our experiments

is, that a high temperature lessens the inhibitory power of the vagus centre in the medulla to such an extent that digitalis, and probably all drugs which act like digitalis on this centre lose, to a great extent, their power to restrain the action of the heart and slow the pulse.

The administration of digitalis, or of drugs which act like it, to patients in a febrile condition, is, therefore, likely to have much less effect on the pulse than at the normal temperature, and if the temperature be very high they may have no effect at all whilst this persists.

When the temperature begins to fall the pulse naturally becomes slower, and this slowness is increased if digitalis has been given at the height of the fever. It is, therefore, evident that digitalis and its congeners, if they are given at all when the temperature is high should be given with great care, for otherwise the medical man may be induced, by the apparent inaction of the remedy, to push its administration too far during the fever, with the consequence of producing too great depression of the pulse during defervescence.

Reviews.

Lectures on the Diseases of Infancy and Childhood. By CHARLES WEST, M.D., &c. Seventh Edition, revised and enlarged. 8vo., pp. 896. London: Longmans. 1884.

A BOOK which has passed through twenty editions in Europe and America carries with it not only the internal evidence of its value, but also the weightiest evidence of its widespread reputation. This edition has not suffered from the fact that its author is no longer in the active practice of his profession, for he appears nevertheless able to keep touch with the progress of modern pathology.

Dr. West, who formerly was one of the most ardent advocates of the opinion that croup and diphtheria were essentially different in their nature, now holds "that for all practical purposes membranous laryngitis, or membranous croup, must be regarded as the outcome of diphtheria;" and he adds, "Diphtheria then is the disease, and croup one of its symptoms." We note, as perhaps an oversight, that in the chapter on the diseases of the urinary organs, no mention is made of the disease described last year by Dr. Gee at the meeting of the British Medical Association as acute pyelitis in infants, the main symptom being presence of pus in the urine.

The Operative Treatment of Intra-thoracic Effusion. By NORMAN PORRITT, L.R.C.P., M.R.C.S. 8vo., pp. 307. London: Churchill. 1883.

THIS essay, which gained the Fothergillian Gold Medal of the Medical Society of London in 1883, is remarkable for the great industry and labour which have plainly been spent on its production. At the commencement is an account of the contents of the thorax and the arrangement of its muscular coverings, with remarks on the physiology of respiration. These are followed by references to the works of leading authorities on the different operations for effusions into the pleural cavity, and to the consideration of these operations the greater part of the essay is given.

In reference to the site of puncture in thoracentesis, Mr. Porritt strongly recommends the selection of a spot at the seventh or eighth interspace near the angle of the scapula, at the junction of the anterior two-thirds with the posterior third. Here he finds that the wall of the thorax is quite as sparingly covered with the soft parts as the site recommended by Professor Marshall in the fifth interspace anteriorly, and he gives other reasons for preferring it.

We quite concur with the author in the advisability of avoiding statistics in discussing the question of the operative treatment of pleural effusions; cases with special features constantly occur which refuse to be grouped with others and require to be treated, each on its own merits. Experience seems to show that a large number of cases, as for instance, empyema in children and uncomplicated serous effusions in the adult, will do well if carefully treated by almost any of the ordinary methods; but there is a residue of sero-fibrinous and chronic purulent effusions, and old-standing or perhaps neglected serous effusions, in which the lung is bound down by adhesions to the chest wall, or perhaps diseased, and these will tax to the utmost the skill and patience of the physician, and may at best result in only temporary improvement. For the treatment, however, of such cases, Mr. Porritt offers many useful suggestions, and his results (given in the appendix) of thirty-eight cases treated in the Infirmary will compare well with those published elsewhere.

Clinic of the Month.

The Tubercle-bacillus and Pneumonia-micrococcus.—The use to which the presence of micro-organisms in the sputa of tuberculous and pneumonic patients may be practically put is illustrated by a paper by Dr. J. Samter, of Posen (*Berl. klin. Woch.*, No. 25, 1884). A debilitated man, sixty-five years of age, suffering from diarrhœa and cough, with scanty expectoration, but without any physical signs beyond those assignable to senile bronchial catarrh, complained one day of great sense of weakness and increased cough. Examination of the sputa by the Ehrlich-Weigert method now revealed, in addition to the bacteria, &c., from the oral cavity, a large number of tubercle-bacilli and some diplococci, which resembled those detected by Friedländer in the sputa and inflamed tissues of cases of acute pneumonia. The physical signs continued negative, although the patient became rapidly prostrate, collapsed, and died two days after the detection of the micro-organisms. The necropsy revealed the existence of a walnut-sized cavity at the left apex, and two cheesy foci, with bronchial dilatation; the right lung was in the "first stage of pneumonia," and beset with miliary tubercles; there was also ulceration of the intestines. Here, it was thought, was a case in which there had been an infection by the tuberculous and pneumonic virus, the invasion of the pneumonia-micrococcus exciting the tuberculous bacilli to greater activity; and it is stated as of etiological interest that a case of typical pneumonia had been admitted into the same ward before the patient in question developed the serious symptoms. Much, however, depends, it appears to us, upon the correctness of the *post-mortem* diagnosis of the pneumonia in this case; the supervention of acute miliary tuberculosis being *per se* sufficient to induce the hyperæmia, which alone was present. Another case is given where pneumonia complicated phthisis. In this case the sputum contained micrococci but no bacilli, which were, however, found in abundance in a cavity in the lung. Here also miliary tubercle supervened, and the writer evidently is of opinion that infection by the "pneumonia-

coccus" is liable to produce a condition favourable to the more rapid growth of the tubercle-bacillus in cases where the latter is not making much progress. (*Lancet*, July 5, 1884.)

Embolic Infarction of Muscles.—That the muscles, like other organs, are liable to be the seat of embolic infarctions is a subject which is discussed by M. Girandeau in a recent article (*Revue de Médicine*, June 1884), and he thinks that the rarity of this event is attributable partly to the fact that the muscles are seldom examined *post-mortem*, and partly (probably mainly) to the readiness with which collateral circulation is established in cases of blockage of a muscular artery. It is different in the case of pyæmia, where muscular metastatic abscesses are frequent; but in ordinary cases of cardiac disease, where the viscera show ample evidence of embolism, there are very few records of muscular infarction. Cornil and Ranvier, admitting this rarity, state that they have met with two instances, and that they were characterised by absence of hæmorrhage. Girandeau supplies notes of three cases. The first was a case of chronic mitral disease, with general atheroma. The right sartorius muscle was found to be ruptured, the broken ends embedded in hæmorrhagic effusion, and their muscular fibres granular. The spleen contained two old infarctions. The second case, of long-standing mitral and aortic disease, with arterial atheroma, exhibited a firm, yellow-coloured mass in the substance of the pectoralis major muscle, sharply marked off from the healthy tissue, and resembling a visceral infarct. The spleen, kidneys, and brain were also the seat of embolism. A third case, quoted from Lefevre's thesis (1867), was of the same class, and was further complicated with dry gangrene of the left foot and leg. In this case a yellowish-grey mass of degenerated muscular tissue occurred in the substance of the vastus externus muscle. These three cases were, it will be seen, of chronic heart disease, and Girandeau asks whether these muscular infarctions could not also occur in the course of acute endocarditis in young subjects. *A priori*, such an event is not impossible; but some experiments made by him at Alfort were wholly negative in their result. He concludes that many conditions may be necessary to the production of the event, among which he enumerates degeneration, roughening, and inelasticity of the arteries; an enfeebled heart; and a more or less marked asphyxial condition, impairing the nutrition of the muscle. (*Lancet*, July 5, 1884.)

Peritonitis from Umbilical Phlebitis.—Dr. J. Lewis Smith reports a clinical lecture delivered by him, in which specimens were exhibited that had been removed from the body of an infant dying at the age of fourteen days. The birth had been normal, and the convalescence of the mother satisfactory. After

the cord dropped there was a slight oozing of purulent-looking matter from the navel. When a few days old, the baby began to be unusually fretful, and when Dr. Smith saw the case on the fourteenth day, peritonitis had already been diagnosticated. The abdomen was much distended and tympanitic, and pressure on it evidently increased the suffering. The temperature was not high, and vomiting had not been a prominent symptom. Death occurred on the morning of the fifteenth day. At the autopsy the abdomen was found to contain six ounces of turbid serum and many flocculi of lymph. Loosely attached fibrin lay along the course of the umbilical vein, and upon the under surface of the liver. A probe could be passed from the navel along the whole course of the umbilical vein, which was filled with a greyish-red thrombus, broken down, and having a purulent appearance in places. The cause of the peritonitis was obvious. The thrombus in the umbilical vein, by undergoing disintegration and decay, furnished the conditions of septic poisoning. It is probable that the patulous state of the vein allowed the air to come in contact with the external extremity of the thrombus, thus admitting the minute organisms that are the active agents in putrefaction, The ductus arteriosus usually closes in like manner by the formation of a fibrinous plug; but being in the interior of the body, remote from the air, the thrombus does no harm. Usually, when the cord is ligatured, the umbilical vein collapses, and its walls contract; hence the infrequency of septic poisoning from thrombi in this vessel. (*American Journal of Obstetrics,* May 1884; *Arch. of Pediatrics.*)

Pyrethrum for Globus Hystericus.—Dr. Roth regards this symptom as due to a paræsthesia of the sympathetic. And as the pellitory root has been found useful in paralysis of the tongue and pharynx, the author was led to try it in globus. He gives from ten to twenty drops of the tincture of pyrethrum four times a day. He reports six cases in which he employed this remedy with satisfactory results. (*Centralblatt für Gynäkologie,* May 3, 1884.)

Systolic Murmur at the Apex from Aortic Lesion.—Dr. Weill calls attention to the fact that whereas the practice of localising murmurs by their external point of greatest intensity is generally correct, there are exceptions to the rule. He reports a case in which atheroma of the aorta and diseased sigmoid valves caused a systolic bruit over the apex, the mitral valve being normal. (*Revue de Médecine,* March 1884.)

Secondary Suture of the Median Nerve.—At a recent meeting of the Academy of Sciences M. Tillaux related two cases of secondary suture of the median nerve followed by

rapid restoration of the functions in the parts depending upon it. The first was a young girl who cut the front of her wrist whilst cleaning some windows in November 1883. The wound healed without suture of the nerve being performed, and there remained complete paralysis of all the parts supplied by it. Incapable of working, the girl went to the Beaujon Hospital to seek relief. The parts supplied by the median nerve were found to be colder than on the opposite side, and of a slightly violet colour. Notwithstanding the discouraging nature of the case, M. Tillaux decided to give the patient a chance. The ends of the nerve were found about a centimetre distant from one another, the central one bulbous, the peripheral atrophied. They were cut so as to present a fresh even surface and carefully drawn together by a hair suture (*crin de Florence*). An antiseptic dressing was applied and the limb immobilised in extreme flexion. Two days after the operation sensibility began to return and increased daily. Six weeks later she left the hospital with sensibility and movement entirely restored. The other patient was a woman who, witnessing the result in this case, begged M. Tillaux to operate upon her also, notwithstanding that the accident had occurred fourteen years before. The operation was identical, and the next day sensibility began to return, and was soon entirely restored. The physiological curiosity of these cases lies in the fact that when examined microscopically (by M. Ranvier) the portions of nerve removed exhibited no trace of cylinder-axis, and that it is difficult to explain the restoration of function by our present ideas on the subject. M. Tillaux's observations may be the starting-point of an important discovery. (*Lancet*, July 19, 1884).

Ætiology of Nervous Diarrhœa.—Professor H. Nothnagel formulates the following conclusions regarding diarrhœa of purely neuropathic origin : Nervous diarrhœas, first so designated by Trousseau, are those which occur as the result of anxiety, fright, or various other intense physical impressions, and occasionally in hysteria, but which are unattended by intestinal inflammation. The diarrhœas in question may be chronic as well as acute. In certain individuals the above-mentioned ætiological agencies merely occasion abnormal frequency of the alvine dejections. In other cases depressing mental impressions may cause a purely nervous diarrhœa to be engrafted upon a chronic enteritis, and to notably prolong the duration of the latter. The author cites cases illustrative of this disease, which, in his opinion, justify the establishment of two varieties of nervous diarrhœa. One category belong to cases in which the evacuations are of fluid consistency, in the other those attended by formed or hardened dejections. In the latter form the author believes that the nervous influence resulting in increased fre-

quency of defæcation is exerted upon the lowest portion of the large intestine in which fæcal matter is already accumulated. In this case the only abnormal feature of the process is the occurrence of evacuations at unusually frequent intervals. A different nervous mechanism must be invoked to explain the occurrence of the fluid evacuations. The author assumes, in these cases, that either the entire bowel is affected by violent peristaltic movements, which mingle the fluid constituents of the discharges emanating from the small intestine with the solid fæcal matter of the colon, or that an abundant transudation of serum, occurring in the large intestine itself, liquefies the solid matter previously accumulated therein. Professor Nothnagel inclines in favour of the latter theory, although unable to furnish convincing proofs of its accuracy. The exciting influences resulting in these two forms of diarrhœa must produce their effect through different nervous channels. In one case those nerves which, under stimulation, occasion increased peristalsis are incited to functional activity, in the other the vaso-motor and secretory nerves are chiefly instrumental in producing the diarrhœa. (*Allgemeine medicinische Central-Zeitung*, May 14, 1884).

Primary Actinomycosis in the Human Intestine.—In a case described by Prof. Chiari, there was nothing during the life of the patient to lead any one to suppose what he was suffering from. He was thirty-four years of age, and for two years had been gradually sinking from marasmus, accompanied by atrophy of the brain, tuberculosis, etc. *Post mortem* there was found in the lower part of the ascending colon and cæcum covering the surface of the mucous membrane a whitish layer of a sort of membranous substance. There were numerous little miliary bodies of a greenish and brownish yellow. The whitish layer in question proved to be unquestionably due to Actinomyces, when examined microscopically. The fungus-filaments had grown into the intestinal glands, and had there undergone calcareous degeneration, and assumed the characteristic form of club-shaped masses. This seemed to have arrested the growth towards the peritoneal surface. There was nothing to show how the patient had become infected with the disease. (*Prager med. Woch.*, 10, 1884.)

Abscess of the Stomach.—A man, aged forty-five, had always suffered from dyspepsia from over-eating and drinking (*Annali Universali di Medicina*, December 1883). Symptoms of chronic gastritis, hæmatemesis, increase of volume of the stomach lasted a long while. No tumour could be found. The temperature was always subnormal. At the necropsy, extensive adhesion of the stomach to the neighbouring viscera was found,

with general and intense hypertrophy of its walls, and great dilatation, the capacity being 4,000 cubic centimetres. The pyloric orifice was not narrowed. There were epithelial abrasions but no signs of ulcer. On the posterior wall near the pylorus an oval fluctuating swelling was noticed, thirteen centimetres long by eight broad; on opening this, 300 cubic centimetres of pus escaped. The abscess was situated in the submucous cellular tissue, between the mucous and muscular coats. No other alteration worthy of notice was found in the other viscera. Dr. Testi's paper, which is a very long one, enters fully into the history of this rare disease, and is completed by a bibliographical list of authorities. (*London Medical Record*, July, 1884.)

Early Operation in Tuberculosis of Lymphatic Glands.—The following results, given by Garre, have accrued from the removal of tuberculous glands. Out of eighty cases, forty only have been completely followed up. All except six of these occurred in the neck, and these six were in the axilla. In half the cases an infective focus could be traced. The glands were completely removed, and in all cases the wounds readily healed. Twenty-one remained healed and had no return. In seven cases some fresh glandular tumours appeared about the size of a hazel nut, whilst ten developed large glandular tumours for a second time. Two died within six months of phthisis. Nine showed symptoms of lung affection, including four who exhibited no signs of it at the time of operation. (*Deutsche Zeitschrift f. Chirurgie*, 6, xix.)

Resuturing of Granulating Wounds.—Some instances of the beneficial results of this procedure have been published by Veit. After referring to the published writings on the subject by Fritsch, Holstete, etc., he describes several cases of his own, particularly a case in which this treatment was applied to a perinæum which was ruptured in childbirth, at once sutured, and in which the edges did not adhere. Resuturing succeeded admirably, and the patient made a good and rapid recovery. The conditions which are essential to success are, that the granulations are fresh and healthy, and of sufficient softness to come readily into apposition. The sutures should be deeply inserted, and from six to ten days after the original operation appears to be about the best time to make the attempt. (*Berlin. klin. Woch.* 2, 1884.)

Abdominal Section for Adherent Intestines.—Mr. Lawson Tait reports the following case. S. B., aged thirty-two, presented herself at the Birmingham Hospital for Women early in November last, complaining of constant pelvic pain

dating from her last confinement, and much aggravated by the patient having "strained herself" six weeks before. On examination, the uterus was found to be somewhat fixed with a mass behind it, very tender on pressure, and clearly cystic. But for the fact that she complained of no increase of pain before or during menstruation, I should have diagnosed the case to be one of occluded and distended tube. As it was, I made no diagnosis, but advised abdominal section. This the patient readily agreed to, and I performed it on November 8th. I found a good deal of matter in the pelvis, and a coil of intestine adherent in the cul-de-sac. I undid the adhesions without much difficulty and closed the abdomen. She left the hospital on November 28th, and has been entirely free from pain since. I have just seen her (July 7), and find that she has had no return of her old symptoms, and is in perfect health. This case is a very instructive one, for the physical signs were precisely those of pyo- or hydro-salpinx; and if it had happened that the patient had suffered much at menstruation, I certainly should have set it down as a case of one or other of those diseases. Suppose that, under this belief, I had acted as some (who have had no experience) advise; suppose I had tapped from below, I should have done no good; I should probably have made my patient worse; I might even have killed her. On the other hand, following my rule of opening the abdomen, I was able, with very little difficulty, to cure completely a condition which distressed the patient, which put her in constant risk of her life, and for which no other remedy was possible. (*Med. Times,* July 19, 1884.)

Sarcoma surrounding the Heart.—Dr. Park reports the case of a girl, aged seven years, who had suffered for eight months previously with laboured respiration, which gradually became so distressing that orthopnœa resulted. She also had paroxysmal attacks of angina. *Examination:* Pulse 150, respiration 40, temperature 98°·8; on the left side of her chest there was a reddish protuberance with varicose veins running over it; dulness all over the left chest. The first sound of the heart was feeble, the second inaudible. The dyspnœa continued, with occasional attacks of angina, until, about a month from the time she came under observation, an unusually severe attack left her so exhausted that death resulted. *Autopsy:* The heart was surrounded by a growth two inches in thickness, of a yellowish colour, and firm consistence. The large vessels had been compressed by the growth. The mass extended some distance down the spinal column; its origin was difficult to trace, but it was supposed to have begun in the thymus gland. Microscopic examination showed it to be a round-cell sarcoma. (*Lancet,* May 17, 1884.)

Chorea as a Complication of Pleurisy.—A few years ago several cases of fatal epileptiform seizures following upon intra-pleural injections in empyema were recorded, especially in France. The subject has again been brought under notice by Dr. Weill of Lyons, who records a case where hemichorea was apparently excited in the same way (*Revue de Médecine*, July 1884). A young man, twenty-four years of age, whilst on military service was attacked with left-sided pleurisy, for which paracentesis was performed. Empyema followed, necessitating drainage and injections, and it was noticed that the left arm became weak immediately after the operation. A year later a second operation was performed, and six months afterwards M. Lépine, under whose care the patient was, deemed it necessary to have portions of the second, third, fourth, and fifth ribs resected. Two days after this operation the left upper limb became the seat of involuntary movements, and shortly after the left lower limb also. These movements were of a choreic character, and were associated with some hyperæsthesia of the hand and a certain degree of ataxy in the lower limb. The condition was attributed to the pleural irritation produced by the antiseptic injections acting on the spinal cord, and thence affecting in a reflex manner the limbs of the same side. This idea of reflex irritation proposed by M. Lépine seems to M. Weill a very reasonable hypothesis, and it would appear as if there were functional and pathological connexions between the innervation of the pleura and that of the limbs of the same side, especially of the upper limb. The occurrence of radiating pain in angina pectoris, and of the shoulder pain in hepatic colic, are instances of a similar kind; and the fact that besides the severe and fatal convulsions excited by intra-pleural injections, there have also been recorded numerous instances of hemiplegia associated with like pleural conditions, justifies the notion that in the present case there is an example of chorea excited by the same path. (*Lancet*, July 26, 1884.)

Extracts from British and Foreign Journals.

Idiopathic Purulent Peritonitis.—Professor Leyden has recently described (*Deutsche med. Wochenschrift*, April 24, 1884) three cases of idiopathic peritonitis. One of these, in a male, ended in recovery, so that its precise diagnosis remains uncertain. The other two were in females, aged twenty and twenty-seven years respectively, and the peritonitis, which was purulent, ran a rapidly fatal course. It had no connexion with menstruation, and the post-mortem examinations showed the absence of any local primary inflammation of the pelvic or abdominal organs. In one of these cases the interesting discovery was made of an abundance of micrococci in the exudation, as well as in the deeper layers of the abdominal wall and the diaphragm. They resembled the micro-organisms which have been met with in puerperal peritonitis and other purulent exudations—*e.g.* pleurisy. The origin of such cases is veiled in obscurity; but perhaps, as Leyden thinks, the detection of these micro-organisms may lead to an explanation, which at the best must be hypothetical—*viz.*, that in intestinal or menstrual derangements such organisms may gain access to the peritoneal cavity and excite inflammation. He speaks somewhat despairingly of treatment, including mercurial inunction, and says that it has long been a question with him whether such cases ought not to be dealt with surgically, on the same principle as an empyema is treated. The difficulty of establishing a diagnosis of the nature of the peritoneal effusion in these very acute cases forms perhaps the main hindrance to the adoption of a measure which might often be the sole means of saving life. (*Lancet*, May 3, 1884.)

Mobility of the Dulness in the Exudation of Pericarditis.—Gerhardt lays it down as a rule that the dulness of the exudation of pericarditis increases considerably in its superior limits directly the patient from the supine assumes the erect position; this is still more evident when he bends forward the upper half of the body—a fact which he makes to depend on a larger quantity of liquid being brought into contact in this position with the thoracic wall. Observations in the clinic of

Prof. Maragliano (*Italia Medica*) show that this change of position of the dulness does not take place in all cases; indeed, in some, precisely the contrary happens, *i.e.* a lowering of the site of dulness. The author gives six cases in proof of this. Of these, the first and second are especially noteworthy, as in them he was able to follow the development of the exudation. At first, on change of position, there was the usual elevation of dulness, succeeded by fall of dulness as the exudation increased. This would only depend on lowering of the diaphragm from the excessive weight of the contents of the pericardium, and at the same time was noticed the diminution or disappearance of the semilocular space of Traube. Elevation as well as fall of the dulness may then occur, or there may be no variation. If the liquid contained in the pericardium be much, there may be moderate elevation of the superior limits; if it be very abundant, there is always a depression of the line of dulness, and both of these independently of the greater or lesser antiquity of the exudation. (*London Medical Record*, May 1884.)

Treatment of Scalp Wounds.—A correspondent has drawn our attention to the treatment of scalp wounds, and in his letter he advocates the employment of the natural hair suture. He of course refers to the prejudice against the more generally employed sutures as tending to favour the occurrence of erysipelas, inflammation, or suppuration. This prejudice, like most others, has a certain foundation in fact. The scalp is remarkable for the looseness with which it is attached to the subjacent bone, and in simple cuts through the scalp blood and serum can readily force a way between the scalp and the bone, and the accumulation induce suppuration. Still more frequently the scalp is torn away from the skull in a longer or shorter flap, and then, if the edges of the wound are united, the serum effused from the under-surface of the detached flap is confined beneath it and suppuration occurs. If this fact be neglected, suturing scalp wounds is a dangerous step; but if it be recognised and acted upon, the sutures are altogether devoid of danger. The main thing in the treatment of any flap scalp wound, however slight the flap may be, is to secure primary adhesion of the flap to the subjacent pericranium and completely prevent accumulation of serum beneath it. This must be secured by properly adjusted pressure; and, in view of this primary indication, but secondary importance should be attached to the rapid healing of the edges of the wound. If a good bunch of hair be taken up on each side of the wound, and twisted, and then used as a suture, it is obvious that the whole surface of the scalp from which the hair springs is held compressed against the subjacent skull, and hence this form of suture skilfully employed

really fulfils the indications of treatment very well. It is an error to suppose that the tissue of the scalp is more intolerant of the presence of a suture than the skin of any other part of the body. (*Lancet*, April 5, 1884.)

Chloroform Astigmatism.—M. Dubois has made an interesting communication to the Société de Biologie on the action of chloroform on the nutritive media of the eyeball and on the mammary gland. On examining the fundus of dogs narcotised with chloroform, he found its characters unusually difficult, and at times impossible, to distinguish. He observed also shadows upon it which seemed to be produced by a particular alteration of the cornea. Irregular astigmatism was present, and was pronounced. By washing the ocular surface, he proved that these appearances did not depend on mucous flakes in front of the cornea. Similar and very marked astigmatism was observed in a man while under chloroform. This abnormality was found to disappear when sensibility returned. Diminution of refraction was particularly noted in one of the dogs. The tension of the globe was in these various cases also lowered. A comparative observation on the mammæ of a bitch appears to throw some light on the ocular phenomena. The breasts, which were turgid with milk at the commencement of anæsthesia, became flaccid and comparatively empty when the animal was fairly comatose. It may be suggested in accordance with these experiments that the peculiarities of refraction above detailed, like the alteration in the breast, are due to relief of tension in the fluid constituents of the organ affected, a condition which may easily occur during chloroform administration if the heart's action continue vigorous, seeing that every vascular channel then undergoes relaxation of its muscular fibre and consequent dilatation, and the escape of its contents is proportionally facilitated. (*Lancet*, Feb. 16, 1884.)

Physiological Action of Condurango.—In a memoir contained in the last part of the *Journal of Physiology*, Dr. Lauder Brunton gives the results of his experiments to determine the physiological action of condurango. This bark is employed in the domestic medicine of the tribes occupying the northern half of South America as a remedy against cancerous and syphilitic diseases. The condurango liane (or creeper) bark from Ecuador is yielded by a plant named the *Gonolobus condurango*, and belongs to the natural order of the *Asclepiadaceæ*, an order of acrid and stimulating plants, which, although some, like the cow-tree of Ceylon (*Gymnema lactiferum*), yield a milky and wholesome juice, yet as a rule are suspicious; many like the *Tylophora secamone* having emetic roots, whilst others, like the *Asclepias decumbens*, are diaphoretic and

sudorific, causing abundant perspiration, without any increase of general temperature. The condurango is a climbing plant, with a stem of the thickness of from one to three inches, and large cordate leaves. The bark is in thin curled pieces, about three inches in length, and of greyish colour. Under the microscope the tissue presents small cells containing starch, and glands filled with calcium oxalate, traversed by lacteals with cloudy brown contents. Although *Gonolobus macrophyllus* is reputed to have furnished the North American Indians with a juice to poison their arrows, condurango does not seem to have any very active properties, for Dr. Brunton found that watery extract of condurango has no action on frogs, even when injected into the dorsal lymph-sac in doses of five grains. On rabbits it has no poisonous action when injected into the peritoneal cavity. When a solution containing fine particles in suspension is injected into the jugular vein, the animal dies with symptoms of opisthotonos. When the coarser particles are removed this does not occur, although the breathing is quickened. Dr. Brunton thinks it is not improbable that the quickening of the breathing is due to the lodgments of fine particles in the pulmonary capillaries, and that the opisthotonos he noticed in one experiment, and which has been supposed by Gianuzzi and Bufalini to be due to the direct action of condurango on the nerve-centres, was really due to asphyxia caused by pulmonary embolism. Unlike quinine, condurango has very little effect on reflex action. Condurango when injected into the peritoneum, even in large doses, has no action on the blood-pressure. Finally, it does not exert any definite action on the arterioles, nor does it paralyse the peripheral terminations of the vagus. (*Lancet*, May 3, 1884.)

Treatment of Phthisis in its Earlier Stages.—Dr. T. H. Green, in the *Lancet*, Jan., 1884, p. 149, and Feb., p. 193, contributes an able lecture on the treatment of phthisis in its earlier stages. By phthisis is meant a more or less chronic pulmonary tuberculosis. Pathology shows us three factors concerned in the development and progress of this disease; (1) A state of more or less constitutional feebleness, either inherited or acquired, which renders the individual abnormally incapable of resisting injurious influences; (2) Some condition of the higher portions of the lungs—probably a tendency to slowness of the circulation—which favours the development of the phthisical process; (3) The introduction of some organism from without, probably the tubercle-bacillus. Diet is an important element in the treatment, and it is essential to give the patients something before they are dressed, as breakfast is often their worst meal. A warm cup of chocolate with plenty

of milk is a very good substitute for the old plan of rum and milk. In cases where there is recent catarrh of the stomach, carbonate of bismuth in doses of from ten to twenty grains, given half an hour before food, continued for two or three weeks proves very beneficial, followed by a mixture of gentian and soda, which may be administered for long periods. Cod-liver oil holds a prominent place in the treatment of phthisis. It should be taken after food. Quinine is useful during pyrexial stages, and in women who are worn out by nursing or worry and weak out of proportion to the lung-mischief. To restrain cough, sedatives must only be given during the night. Some such combination as the following is advised: Solution of hydrochlorate of morphia, spirit of chloroform, and ipecacuanha wine, of each three minims; oxymel of squills, or syrup of tolu, twenty minims; gum arabic mucilage, twenty minims; water to one drachm; to be swallowed slowly, and taken three or four times during the night, but to be avoided during the day. To prevent night-sweating, a pill consisting of from a quarter to half a grain of the extract of belladonna, and from two to three grains of oxide of zinc, given at bedtime, is very useful. In cases where there are marked pyrexial attacks, the use of quinine and digitalis is recommended. The question of the effect of climate is touched upon, and two ways are noted in which climate favourably influences the progress of early phthisis—(1) by its invigorating effect, and consequent power of improving the general health; (2) by its local influence on the diseased lung. Of these, the former is probably the more important. With regard to the question of destroying the bacillus by inhalation, when the disease is established, the author does not think that antiseptic inhalations have the power of doing this as yet, but hopes that, with the discovery of more perfect methods, this will be possible. (*London Medical Record*, May 1884.)

The Uses of Hydrobromic Acid.—Dr. Joseph Parish, of Burlington, New Jersey, writes, referring to an article by Dr. C. L. Dana (*Journal of Mental and Nervous Diseases*), on hydrobromic acid, that he has recently used it in two cases. "In one it relieves the insomnia in fl. ʒj doses, taken p.m., say three doses a few hours before retiring. The other is a neurasthenic case, in which there is enlargement and hardening of the sciatic nerve and general neuralgia. In this case I have given the bromides in several forms with but little impression, except bromism. Hoping to avoid the bromism, I resorted to 10 per cent. acid, with the effect of bringing out the bromism as distinctly as when she took either of the salts. In direct opposition to this case, I have a lady of forty, an epileptic, who has taken bromide of

potassium, in doses of from half a drachm to a drachm and a half, three times daily, for the last fourteen years, without the slightest sign of bromism." Dr. Squibb writes of hydrobromic acid in *Ephemeris*: "Its most common, and probably most effective use, is as an addition, either constantly or intermittently, to solutions of the bromides when these have to be taken for a long time and in full doses. In this way full bromide doses may be easily maintained, while the effect of the bases is diminished. Full doses of the acid are difficult to administer on account of its intense acidity. It is best given with sugar or with syrup, or with the syrup of acacia, and with lemon syrup it is somewhat like lemonade. Large dilution is always advisable. The dose of the officinal acid is two to four fluid drachms, which is equal in bromide to seventeen or thirty-four grains of the potassium salt. An equivalent dose of the 34 per cent. acid is about twenty-seven to fifty-four minims. The acid is very useful in making extemporaneous solutions of many bromides. For example, the very effective bromide of lithium may be very easily made extemporaneously by prescription, by simply saturating, or nearly saturating, the acid with lithium carbonate." (*London Medical Record*, May 1884.)

How to Take a Pill.—Dr. Samuel E. Wills, Earlville, Maryland, suggests the following method:—Having noticed that if a person at meals inclined the head backwards, as in laughing, while there was food in the mouth, he was pretty sure to be strangled from "the food going the wrong way," I instructed those of my patients who had difficulty in swallowing pills to *keep* the head in the position they would if eating and swallowing food at the table—that is the head inclined forward, the chin near the breast. If a small portion of saliva be on hand, or a small quantity of water taken after the pill is put in the mouth, it will surprise the patient and gratify the doctor to witness the facility with which it will be swallowed. To direct the patient to keep his eyes on his toes I have found a help to keep the head in the proper position. (*Med. and Surg. Reporter*; *Birmingham Med. Review*, July 1884.)

Infant Feeding in Illness.—The following useful observations, by Dr. Keating, occur in the *Archives of Pediatrics* — "If a child is so weak and exhausted that it will not digest the mildest form of prepared food, and it is impossible to obtain the breast, it is useless to weaken the condensed milk, or whatever we use, to such a degree as to make it absolutely valueless as a nutrient. The proper thing to do is to give some form of food which requires but little action of the digestive juices, or to prepare the food so that it is partially digested beforehand. I have used for some time, with great advantage, egg-albumen dissolved

in water as a food for sick children when the stomach is intolerant of ordinary milk food. I have also observed that gum-arabic water will nourish for a surprisingly long time and allay irritability. Barley food would be valueless in a case of this kind, and pure cow's milk, diluted to resemble as closely as possible the mother's milk, would be regurgitated. In such cases the preparation of milk which has undergone partial digestion by the pancreatic ferment, in an alkaline condition, I have found most useful. The preparation is one which must be made with care, and according to the following directions: Into a clean quart bottle put a powder of five grains of extractum pancreatis, and fifteen grains of bicarbonate of sodium, and a gill of water; shake, and then add a pint of fresh milk. Place the bottle in a pitcher of hot water, or set it aside in a warm place for an hour or an hour and a half, to keep the milk warm, by which time the milk will have become well peptonised. When the contents of the bottle acquire a greyish-yellow colour, and slightly bitter taste, then the milk is thoroughly peptonised—that is, the casein of the milk has been digested into peptone. Great heat or cold will destroy this digestive action; so, to prevent all further action when you think that digestion has proceeded far enough, at once place the bottle on ice, or into a vessel of boiling water long enough to scald the contents, and it may then be kept like ordinary milk. The mother should be warned to frequently taste the milk during its digestion, and as soon as the bitter taste is in the *least* apparent, the bottle should be placed on the ice for cooling, as in these cases it is sufficient to partially peptonise the milk. I mention these facts, particularly as, strange to say, I have always failed with it in hospital practice, whereas in private I have had some excellent results, owing, I think, to the extra care in preparation. *Whey* is another admirable alternative in these cases. It may be made with wine, when there is great weakness; but mothers do not often know how to make wine-whey. The proper method is, when the milk is boiling, to put in a wine-glassful of sherry, say, to the pint; and if the curd does not separate, then add more wine until it does. As soon as you notice separation of the curd, add no more wine, but let the mixture boil for a time, until the whey and curd have become thoroughly separated—consuming about five minutes. This should be thoroughly strained. It has been recommended to use *lime-water* in the feeding of infants and young children. I am opposed to its indiscriminate use. I have seen children who could not tolerate even the weak preparation of the pharmacopœia. Undoubtedly at times it may arrest vomiting, as we all know, both in children and adult practice, but I much prefer, when it is necessary, to use an alkali—and if you use cow's milk raw for a young babe, it is always advisable

to see that it is made alkaline—to do it with a small quantity of bicarbonate of sodium . . . . I have one word of caution to give you in regard to the use of *sucking-bottles*. They are certainly useful as labour-saving machines in early infancy, and when thoroughly cleansed and carefully watched are no doubt indispensable; but I have long come to the conclusion that if you can persuade the mother and nurse to take the time and feed the child that is old enough to manage by the cup or spoon, the word *colic* will seldom meet you in your practice. I am convinced that in institutions for foundlings, if it were possible to discard the bottle the percentage of deaths would be much diminished." (*Med. Times*, June 21, 1884.)

Amblyopia from Tobacco.—The distinguishing characters of this form of amblyopia, according to Dr. Masselon, are as follows: (1) Reduced vision in varying degree, appearing gradually or suddenly, affecting both eyes; but of unequal intensity on the two sides. There is the appearance of a veil before the eyes, or of a cloud in which the patient seems at times to see snow-flakes falling. The sight improves somewhat after sunset. (2) Central scotoma for colours. This is a sign always present, and one of special diagnostic importance in those cases in which the ophthalmoscope reveals no lesion. The following is the author's mode of testing the colour sense. A card is pierced with a hole four or five lines in diameter, and at the distance of three lines from the hole, a dot is marked on the card. One eye being closed, the patient looks attentively with the other at the hole in the card behind which other coloured cards are passed. It is found that blue is the only colour recognised without hesitation; green is taken for a light grey, and red for a dark grey or black. If the patient now looks at the point beside the hole, and not at the hole itself, he distinguishes the three colours without difficulty. Thus in amblyopia from tobacco there is central scotoma for green and red, but not for blue. In some cases of long standing the green cannot be determined in the second test. This is because the scotoma for this colour has increased to such an extent as to cover the entire visual field. Patients thus affected complain often of their inability to distinguish gold from silver coin. (3) Finally there is a modification of the field of vision in the perception of white. This is not ordinarily noticed, but a careful examination will reveal the fact that the greater part of the upper half of the visual field is the seat of a scotoma of varying intensity, but of equal extent in the two eyes. According to the author this symptom is pathognomonic. (*Gazette Médicale de l'Algérie*, May 15, 1884; *N.Y. Med. Record.*)

Antipyrin.—The introduction of the antipyretic kairin has

hardly been twelve months before the world when a new chinolin-compound is described by Knorr of Erlangen, and termed by Filehne "antipyrin" (*Zeitsch. für klin. Med.*, vol. vii., part 6). Already records are being published descriptive of the effects of this latest of antipyretic agents. Guttmann of Berlin (*Berl. klin. Woch.*, No. 20, 1884) gives his experience of it in twenty-seven cases, including pneumonia, typhoid fever, scarlet fever, relapsing fever, facial erysipelas, phthisis, &c. The drug was given in doses of from four to six grammes, generally in two or three portions of two grammes at an hour's interval, in solution or powder; and the general effect was a depression of temperature for at least five hours, often longer. The temperature fell gradually and continuously to the extent of from 1° or 2° Celsius (*i.e.* from 2·2° to 4·5° F.) or even more, the fall in temperature being accompanied by a fall in pulse-rate, and in cases of great depression with profuse sweating. In only one case were any unpleasant symptoms produced, such as vomiting; in all others the drug was well borne. The subsequent rise of temperature was unaccompanied by any rigor, as appears to happen sometimes after kairin. Guttmann observes that quinine in half the dose of antipyrin produces the same effect, but that the cost of the former is much greater than that of the latter. Ranke of Stuttgart (*Deutsch. med. Woch.*, No. 24, 1884) has prescribed it in thirty-five cases, including pleurisy, pneumonia, typhoid fever, acute rheumatism, tuberculosis, erysipelas, and pericarditis, and confirms the above statements as to its certain and rapid action, with freedom from toxic effects. Injected subcutaneously, antipyrin has a more powerful and rapid influence than when administered by the mouth, a dose of two grammes of a concentrated solution in the former method being equivalent to one of from four to six grammes in the latter. Ranke also thinks it, in general, an excellent substitute for quinine. Lastly, F. May, assistant at the Burgh Hospital of Cologne, gives full details of cases, with charts, &c., in which this drug was employed, in the same journal (Nos. 24, 25, and 26). (*Lancet*, July 5, 1884.)

The Prevention of Hydrophobia.—MM. Pasteur, Chamberland, and Roux have made the following communication on the prophylaxis of rabies by inoculation with a modified virus. They find (1)—That the virus transferred from the dog to the ape, and cultivated by propagation through several members of the latter order, becomes progressively feebler after each inoculation. After a certain period of such cultivation, if it be hypodermically administered to dogs, guinea-pigs, or rabbits, even by intracranial injection (the most deadly method), death does not result, but the animal acquires an immunity from

hydrophobia. (2) If on the other hand the poison of rabies be cultivated in successive rabbits or guinea-pigs only, its potency is intensified, and after a time is so great that a fatal issue invariably follows its inoculation. The poison as found in the dog is intermediate in strength between that of the two methods of cultivation just mentioned. Thus, by careful selection of the medium, and the stage of cultivation, it is possible to accumulate a store of attenuated virus which can be relied on to communicate a modified rabies whose inoculation shall be protective against its severer forms, as that of vaccinia is against variola. There is also good reason to believe, though the actual experiment is postponed, that as with vaccinia, the modified poison hypodermically engrafted immediately after the bite of a rabid animal, will forestall, by the speed of its development, the symptoms due to the bite. No experiments have as yet been made on the human subject. (*Progrès Médical*, May 1884.) The experiments which M. Pasteur is reported thus far to have made are said to be an unbroken success. Fifty-seven dogs have been the subjects of investigation. Of these nineteen were rabid, and by these thirty-eight healthy animals were bitten under uniform conditions. Of the thirty-eight, one-half the number had been previously inoculated or "vaccinated" with attenuated virus; the other half had not. The latter, without a single exception, died with unequivocal signs of rabies, whereas the nineteen others remain as well as ever. They will be watched for a year by veterinary surgeons to see whether the inoculation holds good permanently or only temporarily. If rabies be not spontaneous in its origin, and if the experiments of Pasteur all turn out successful, there seems no reason why canine madness should not be extirpated from our midst. (*Lancet*, July 12, 1884.)

Bibliography.

Le Gymnastique, notions physiologiques et pédagogiques, applications hygiéniques et médicales. By A. Collineau, M.D. etc. 8vo, pp. 824, with 136 woodcuts. Paris: Baillière. 1884.

Médicine et Thérapeutique rationnelles. By Dr. Henri Coiffier (du Puy). Sm. 8vo, pp. 432, with four woodcuts. Paris: Baillière. 1884.

On the Origin of Anæmic Murmurs. By James Kingston Fowler, M.A., M.D., etc. 8vo, pp. 45. 2*s.* London: Churchill. 1884.

Medical Education and the Regulation of the Practice of Medicine in the United States and Canada. Prepared by the Illinois State Board of Health, and published by the permission of the Board. Revised and corrected to March 1, 1884. 8vo, pp. 270. Chicago: W. T. Keener; London: Trübner and Co. 1884.

The Alpine Winter Cure: with Notes on Davos Platz, Wiesen, St. Moritz, and the Maloja. By A. T. Tucker Wise, M.D., etc. New edition of the Alpine Climate Series. 8vo, pp. 85, with Map and Tables. London: Baillière. 1884.

A Statistical Inquiry into the Nature and Treatment of Epilepsy. By A. Hughes Bennett, M.D., Physician to the Hospital for Epilepsy and Paralysis, and Assistant Physician to the Westminster Hospital. 8vo, pp. 47. London: Lewis. 1884.

Student's Manual of Electrotherapeutics. By R. W. Amidon, A.M., M.D. New York. Sq. 8vo, pp. 93, with woodcuts. New York: Putnam. 1884.

*** Any of the foreign works may be procured on application to Messrs. Dulau, of Soho Square, W.C.; Williams and Norgate, of Henrietta Street, Covent Garden, W.C.; or Baillière, of King William Street, Charing Cross.

JOHN NETTEN RADCLIFFE.

AT the time when Europe is again threatened by the epidemic of cholera, which has already attacked its southern shores, there has passed away from amongst us a man who has contributed more than any other to our knowledge of the mode of propagation of this dread disease. While attached to the Turkish army during the Crimean War, Mr Netten Radcliffe had his attention directed to questions of public health, and the knowledge he then gained of Eastern countries and Eastern habits stood him in good stead in after life. After his return to London, the attention of the British Government having been attracted by the outbreak of cholera prevailing in Europe in 1865, Mr Netten Radcliffe was selected to draw up an official report regarding its origin and diffusion. When cholera broke out in the east of London in 1866, he was employed to investigate into its causes, and his success in tracing the outbreak to the distribution of infected water from certain reservoirs was probably not only the most important work of his life, but one of the most valuable observations ever made, or likely to be made, regarding the spread of the disease. Shortly after this report Mr Radcliffe was permanently employed by the Privy Council Office as medical inspector; and when the Local Government Board was formed, he was appointed an assistant medical officer. In this capacity he continued to work at epidemiology, and his enquiries into the relations of erysipelas and pyæmia to faulty hospital construction and management, into the spread of typhoid fever by milk, and into the means of preventing

excrement nuisances in towns and villages, have all been of the greatest utility, while the Report he issued in 1881 on the Levantine plague was specially important to commerce, as it exposed the fallacies of quarantine regulations.

Ever since the Public Health Department of the *Practitioner* was begun, in May 1873, by the lamented Dr Anstie, Mr Netten Radcliffe has been intimately associated with the Editor in the conduct of this department, and its success has been mainly due to Mr Netten Radcliffe's wise counsels and willing aid.

While the sanitary administration of this country is keenly feeling the loss of one of its principal advisers, and epidemiologists British and foreign alike are deploring the loss of a fellow-worker whose place it will be difficult to fill, those who were personally associated with Mr Radcliffe mourn the death of a friend whose ready help on every occasion earned their undying gratitude.

Department of Public Health.

ON THE NATURE OF THE SO-CALLED "ROCK FEVER" OF GIBRALTAR.

BY WILLIAM TURNER, M.A., M.D. (EDIN.).

Civil Hospital, Gibraltar.

THE more recent literature bearing on the subject of the continued fevers has directed attention, not so much to the now fairly-well recognised boundaries which separate typhoid or enteric fever from the allied malady typhus, as to the necessity of establishing a limit which will clearly define enteric on the other hand from the domain of "simple continued fever," "bilious fever," "febricula," &c. The tendency has been to differentiate the forms of continued fever vaguely and indefinitely, and to assign to them names suggested by their more outstanding symptoms, by their pathological products, or by the localities in which they occur—names which convey so diverse ideas as to their essential nature that it is a question whether this complication of nomenclature has not been overstrained and become confusing, so as to prove an obstacle to the discovery of the best means of treatment and of prevention. It is evident that until the physician has arrived at a right understanding of the whole natural history of any given species of fever, and referred it to its order, sanitary science cannot be expected to make substantial progress towards its ultimate suppression. The time is yet distant when the physician may consider that he has completed his task in elucidating the

nature of the zymotic fevers, and has supplied to the sanitarian the means and information necessary to effect their complete extermination.

A form of continued fever prevails in Gibraltar, especially during the summer and autumn months, and it has been considered by many observers to be a fever *sui generis.* It has accordingly received a variety of specific names—"rock fever," "Mediterranean remittent fever," "gastric remittent fever," "typhomalarial fever," "ileo-fæcal fever," "complicate fever," "simple continued fever." Such are the terms presented to the medical officer who enters on practice in Gibraltar, and he must needs adopt one or other of them until experience has led him to alter his views, or to frame a fresh term for his own use. Experience during the past two years, in observing and treating this fever in all its phases, has led me to believe that the bulk of the cases differ in no essential respect from enteric fever as it is met with in England and elsewhere; that although the mode of expression and the severity of the fever may be modified by surrounding influences, the extent of variation is not so great as would at first appear; and that the idea of a specifically distinct "rock fever" cannot be entertained.

In support of this view I propose to sketch briefly the general physical conditions and sanitary arrangements which are met with in the town of Gibraltar, and thereafter to bring forward such facts from clinical and pathological experience of the disease under consideration as may have any important bearing on the question of its essential nature.

The town proper of Gibraltar—a densely populated area—is situated on the lower portion of the western slope of the peninsula towards its northern extremity. The upper portion of the town reaches to a height of 250 feet above sea level, and is built on a steep incline with limestone rock as a foundation. The lower part, bordering on Gibraltar Bay, has shingle and sand for its foundation, and is more or less flat, standing but a few feet above sea level.

A system of sewerage pipes of modern design, and jointed with cement, has been recently laid throughout the principal parts of the town, and these are ventilated to some extent by gratings in the streets and lanes, as well as by a series of shafts

built, some along the face of the rock above the level of the town, others along the line of fortifications on the sea wall. These ventilators permit, in the summer months more particularly, the escape of the most offensive gases, which are, I am persuaded, dangerous to those persons who live near them, or have to remain any length of time in close proximity to them. There is, in the poorer class of dwellings especially, no proper ventilation of house drains nor any efficient arrangement to prevent the reflux of sewer gas into the interior of the dwellings.

The water supplied for the purpose of flushing the sewers is limited in amount, and is derived from wells sunk outside the town in a sandy neck of land which unites Gibraltar with the Spanish mainland. From these wells a brackish water is pumped into the town, and is distributed in pipes to every house for sanitary purposes only. Occasionally, however, some of the poorer inhabitants drink this "sanitary" water.

The drinking water consists of the winter's rain collected from the house roofs and stored in deep masonry tanks built under the houses. The solid matter carried in suspension in the rain into these tanks soon falls to the bottom, leaving a clear, wholesome, palatable water to be pumped up for household use. I have myself analysed several samples of this tank-water, and have reason to think that it is properly stored. No objection can be raised regarding its use as a potable water, nor have I ever suspected it to be a source of disease of any kind. The average yearly rainfall is thirty-four inches, but the actual fall during the past fifty years has varied from fifteen to eighty inches. Thus the rain water stored in the tanks is in some seasons sufficiently abundant to supply the inhabitants throughout the whole year, but in other seasons it is not sufficient, and has to be supplemented from the wells in the neighbouring Spanish villages. I should not, however, omit to mention that a limited supply of wholesome water can also be obtained from a well sunk inside the garrison. This supply consists of rain water collected from the surface of a large flat parade ground, filtered to a considerable depth through sand. It is sold in barrels about the streets of Gibraltar, as is also the water introduced from Spain. I

believe that much of the water brought from the Spanish wells is unfit to be drunk; most of the samples that I have analysed having been highly charged with chlorides and organic matter.

As a rule during the five months from the beginning of May to the end of September no rain falls, and the Rock is then exposed to the unmodified action of a scorching sun. The favourable influence exercised by this excessive heat and drought on the fermentive processes within the sewers is indicated by the increased density of the gaseous emanations from the ventilators and gratings.

Thus, although the situation of the town seems to present many natural facilities for successful sanitation, some important obstacles and defects in the system may be enumerated. These are: the overcrowding of the poorer inhabitants, their squalid and careless habits of living, the excessive heat and drought in summer, the want of proper provision for the safe disposal of sewer-gas arising from (*a*) the faulty construction of many of the house-drains, (*b*) insufficient ventilation of the sewers (*c*) insufficient flushing of the sewers, (*d*) insufficient fall of the sewers in the lower portion of the town.

The statement that during certain seasons of the year a species of continued fever is prevalent in Gibraltar will be accepted as free from exaggeration by all who have had opportunities of observing and studying the maladies of the Rock. And yet the majority of the cases are so mild in type, that a reference to the register of deaths shows remarkably few returns under the head of any form of continued fever, not more than one in seventy-two of the total deaths during the past six years being attributed to this cause. I find, on reference to my notes, that among the indigent poor of the civil community residing in the central districts of the town, I have attended at their homes, and treated to an issue, during the years 1882 and 1883, over 900 cases of illness. Of these, 115, or nearly one in eight, have been attributed to continued fever, including febricula; and of the 115, but two have died. My experience in practice among the upper classes of the community yields similar results.

The peculiar features of the disease will be readily exposed by relating briefly the main points in the history of some actual typical cases.

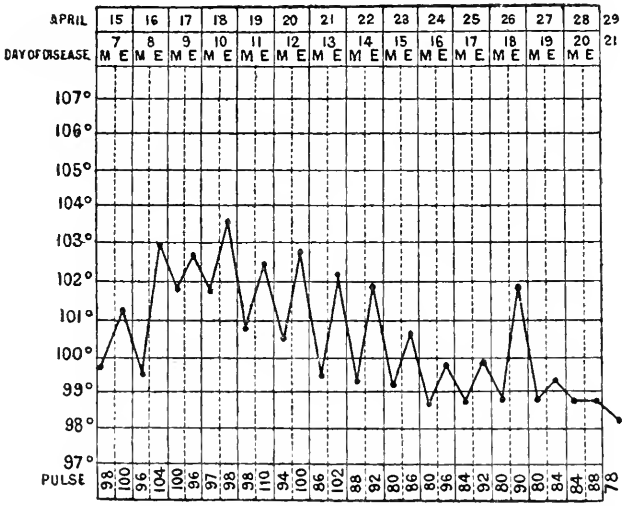
Mrs. K., aged 34, an English lady, began to complain of frontal headache and severe indisposition on April 9, 1883. She was then engaged in nursing one of her own children, who had been laid down with fever some days previously. As I was in daily attendance on the child, I had opportunities of watching the progress of Mrs. K.'s case accurately from the first. From day to day I observed her complexion become more and more overcast, and an expression of fatigue and anxiety gradually displaced all traces of her former health. Although the weather was warm and pleasant she complained of constant chilliness, that could not be dispelled by wearing fur clothing, by crouching over fires, and by using every means to promote a feeling of comfort. Moreover, her appetite had entirely failed her.

In the belief that this condition was probably due to prolonged watching in the sick-room, I recommended my patient to take exercise in a game of lawn tennis, with a view to dispelling it. No improvement, however, followed this measure, and on the following day her temperature had risen to 102°·5. The headache had become so intense that she willingly consented to remain in bed, and I prescribed for her fever diet, and a diaphoretic mixture containing tincture of aconite, together with an aperient. No amelioration of symptoms resulting from these measures, a five-grain dose of calomel with ipecacuanha was given, and the bowels were thereby relieved of a loose stool containing light orange-coloured scybala. Meantime, a high temperature was maintained, and no abatement of the intense headache had taken place. On the following morning—the tenth day of the fever—I was informed at my visit that my patient's behaviour had been giving much alarm to those around her, alternate seizures of uncontrollable laughing and sobbing having supervened. Relief from this condition of hysteria and from the overpowering headache followed on the eleventh day, the application of a blister to the nape of the neck, and the administration of bromide of potassium and digitalis in moderate doses. The effect of the bromide in removing the congestion of the face, and maintaining a condition of somnolence, was most marked and gratifying.

Thus, on the twelfth day the patient, though still feverish, remained free from acute suffering; the tongue wore a thick,

dry, brown fur, there was tympanites in both iliac regions, and there were some uncertain spots on the abdomen and chest. The bowels had been somewhat loose during the previous two days, but had again become confined, and from this date till convalescence they had to be daily relieved by enemata. The case progressed favourably until the twenty-second day, when convalescence was established; and by the aid of a good bark tonic the appetite was rapidly restored. Mrs. K., however, remained thin and anæmic for many weeks, and was completely restored to health only after some months' residence in England.

Annexed is the temperature chart of her case.



To complete the history of this case it should, however, be mentioned that two more cases of fever occurred in the same house at the same time, so that four out of a family of eight were attacked by the disease. Two of the four were more severe and more prolonged cases than that of Mrs. K., while one was so mild that the temperature was raised for not more than four days. One of the cases was so severe that the temperature on one occasion ran as high as 105°·5, and on three successive days the evening temperature reached over 104°. This case was complicated almost from the beginning with catarrhal bronchitis from the thirteenth day of the fever, and

with acute articular rheumatism. Diarrhœa was not a prominent symptom in any of the four cases; in two of them it may be said to have been entirely absent, and in one only was it markedly typhoid in appearance. In one of the cases only was the typhoid eruption clearly recognisable.

In regard to causation in this instance, I found that some four weeks previous to the onset of the first case, a drain that had been choked outside the house under a bed-room window had undergone repair, and a sickening odour had permeated the house for some days afterwards.

In no instance that I have met with, however, was causation so clearly traced to emanations from the sewers as in the following.

J. S., a carbonero, left his work on June 28, and took to bed complaining of fever, severe frontal headache, pain in the neck, and across the upper part of the abdomen. On the following morning he attended my hospital consultation, when he was found to be so ill that I advised him to return to bed, and I promised to visit him at his own house. Meanwhile, I prescribed for him a purge containing calomel, and a diaphoretic mixture. On paying my first visit next day to the patient's house, I found him in high fever, trembling, and almost delirious, very deaf, and complaining much of his head and abdomen. The tongue was dry, brown, and tremulous. Bronchial catarrh existed, with slight cough.

Four days later a profuse diarrhœa had become established; there was considerable distension of the abdomen, with gurgling, and the thermometer registered 105°·5. There was, moreover, a clearly-marked typhoid eruption on the chest and thighs. Briefly, this case ran a rapid and virulent course, and death occurred on July 9, eleven days after the patient took to bed. No post-mortem examination was permitted.

During the course of this case three sisters aged 3, 5, and 9 years respectively, residing in the same house, were attacked with the fever. One of these cases, that of E. S. aged 3 years was ushered in on the 5th July by convulsions, ran a severe and rapid course characterised by high temperature-range, prolonged delirium, well-marked typhoid eruption, complete absence of tympanites and diarrhœa, (the bowels requiring to be relieved

daily by enemata), and ended in death on the 11th July, six days after the first symptoms were recognised. No post-mortem examination was permitted.

In another of the four cases occurring in the same house the first symptoms observed on July 3rd were somnolence and diarrhœa, the patient herself making no complaint of pain. The diarrhœa continued for four days, was typhoid in character, and stopped without special treatment, no typhoid spots were observed. The temperature remained high for 8 days and then gradually abated, the child passing into convalescence about the 12th day.

The fourth of the cases occurring in this family was that of E. S. aged 9 years, who had been removed to the house of a friend on the 29th June on the first appearance of illness in the family. She had been absent for 7 days when she was brought back to her mother complaining of headache, drowsiness, and pain in the bowels. The bowels were constipated and for a time remained so in spite of ordinary aperients; but diarrhœa set in spontaneously on the 12th day of the fever. There were then five or six loose typhoid motions a day. The temperature fell to normal on the 19th day, but convalescence in this and in the previous case was greatly prolonged, the children remaining miserably thin and blanched as if they had been completely drained of adipose tissue and red blood-corpuscles.

An interesting and important feature of this outbreak relates to the sanitary state in which the house was found on inspection by Surgeon-Major Staples (medical officer of health) and myself, In one large apartment a family of nine persons lived, ate, and cooked. Adjoining this were two other apartments separated only from the former by loose planking. One of these apartments was a watercloset lighted and ventilated only through the interspaces in the boarded walls of the adjoining rooms. The wood-work of the watercloset was worm-eaten, and soaked with fluid excreta, and owing to the defective condition of the water apparatus for several months past a loathsome stench of fermenting sewage pervaded the place, and made its way freely into the adjoining apartments. In these apartments, and in actual contact with the badly-fitting boards of this filthy closet wall, were the beds of the unfortunate children.

The statement of the mother of the family was to the effect

that the smell of sewage in the rooms was so offensive that the door and windows had to be kept open day and night, and that necessity only compelled them to occupy the house.

There could thus be little doubt that in this case the cause of the outbreak was gaseous emanations from the sewage into the house. The family were using water brought from Spain, in common with their neighbours, and there were no other cases of fever in that neighbourhood at the same time. That the fever was enteric in its nature is likewise beyond doubt, yet it is greatly to be regretted that post-mortem proof of the fact could not be obtained. The great variety in degree of severity which the disease may assume, and the want of uniformity in its manifestations are also well illustrated in the cases described. Thus in some of the cases the typhoid eruption was well-marked, in others it could not be detected. In some diarrhœa was profuse, in one constipation persisted throughout, although the case ended fatally. One case was exceedingly mild in its course and manifestations, the others assumed grave forms of the disease. Yet all the cases were attributable to a common cause.

In deciding the question as to the true nature of this fever, it is necessarily of paramount importance to consider the morbid appearances met with in cases that have proved fatal. My own experience in this respect is limited to two post-mortem dissections performed on cases that have died under my charge in the Civil Hospital.

The first of these, A. V., aged 24, a labourer, was admitted to the Civil Hospital on the 23rd December 1883 complaining of severe abdominal pain, fever, and profuse diarrhœa. He had been ailing for ten or twelve days, and had been seriously ill for four days before seeking hospital treatment. On examination he was found in a state of high fever with a tendency to delirium. The abdomen was distended, and gurgling was felt on palpating it. There was copious watery diarrhœa, and typhoid eruption was well-marked. The case though severe seemed for some days to be progressing favourably, but fatal collapse occurred quite unexpectedly on the 12th day after the patient's admission to hospital.

In post-mortem section of the body I found the peritoneal cavity filled with pale yellow fluid fæces. The peritoneal

covering of the bowels and the omentum were greatly congested, and a ragged-edged perforation of the gut was discovered at the lower part of the ileum. The entire alimentary tract was removed for examination. The lower reaches of the small intestine had their mucous lining extensively ulcerated in round-shaped patches with thickened edges and congested bases. The spleen was considerably enlarged, and some of the mesenteric glands were swollen, the liver contained a large quantity of dark liquid blood.

The second of the fatal cases was that of Mrs. D., aged 26, the wife of a Colour-Sergeant of the 47th Regiment. She was admitted to the Civil Hospital on 28th December 1883 complaining of lassitude, loss of appetite, fever, and slight bronchitis. She had given birth to a child a month before admission, had made a good recovery, and got up on the 10th day. Her husband had been sent to the Military hospital some weeks before suffering from a severe attack of fever from which, it was said, he had narrowly escaped with his life. Mrs. D. had been three days ill when she was admitted to the hospital. At that time no very serious symptoms presented themselves, but she was exceedingly nervous, and had grave forebodings as to the issue of her illness. The bowels were distended and tender on palpation. The uterus was well involuted, and the discharges were normal. Some mucous râles were heard in the upper part of the chest.

On the 5th day after admission diarrhœa set in, and soon assumed a typhoid character. On the 12th day the tongue had become hard, dry, and glazed, and the mouth was clogged with tenacious mucus. The abdomen was distended and gurgling. The muscles were tremulous, and cough was troublesome. On the 17th day delirium supervened, and there was no well-marked morning remission of temperature, which was maintained above 103°; no distinct typhoid spots were at any time observed. The patient died exhausted on the 22nd day after admission.

Post-mortem.—The abdominal cavity was found free from peritonitis. The mucous membrane of the stomach was in patches deeply injected with bright blood. The small intestine, especially at its lower portion, was of a bright brick-red colour from arterial congestion. The mucous membrane showed

portions of abraded surface, and the same appearance was also continued in the large intestine. The walls of the whole intestinal tract were unusually thin and atrophied looking, and in parts appeared as if composed almost solely of the serous coat; there were no characteristic typhoid ulcers. The mesenteric glands were swollen and black, some of them almost gangrenous. The spleen was enlarged to double its normal size. The uterus was normally involuted and bore no signs of disease. The lungs contained some catarrhal exudation which was poured out on section being made. The heart was normal.

Such then are a few samples of Rock Fever as I have witnessed it in the past two years, and although I might have greatly extended the list of descriptions of cases, I trust I have supplied sufficient material to enable any one interested in the subject to form an opinion as to the proper classification of the disease.

An examination in detail of the more important symptoms and complications of the disease may serve to show more clearly its identity with Typhoid Fever as observed and described by English practitioners.

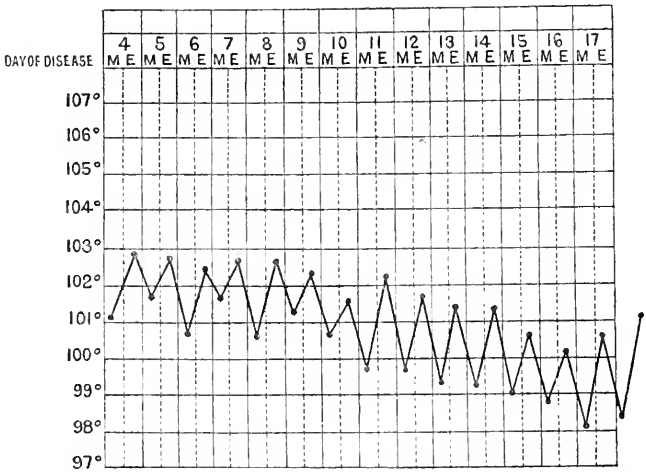
The *insidious onset* of the fever generally renders it impossible for some days to predict, in any given case, what the disease will eventually prove to be, and it also unfortunately precludes the possibility of attaching an exact date to the commencement of the stage of invasion. Indeed it seems probable that in many of the cases the existence of fever is not discovered, or is ignored even by the patients themselves, until the disease has run to an advanced stage of its course. I have heard of an instance that occurred two years ago, in which a soldier who had remained on duty throughout the disease, dropped down at his post, an examination of his body revealing the characteristic appearances of the typhoid lesion.

Headache, generally frontal, is a frequent symptom in the early part of the disease, and when severe it is difficult to control. I have known a case resist the most active external and internal treatment for days, and subside suddenly, apparently uninfluenced by remedies. It is generally associated with peculiar depression of spirits, and in females often with hysteria.

The *temperature* has generally been raised above normal for some days, and has reached a high range before the disease is

detected, so that the evidence of the chart is rendered thereby less valuable. The morning remissions are almost always well marked, although in severe cases the temperature is apt to be maintained at a high point. The temperature-curve as a whole approaches in many instances that of the typical typhoid chart, but, as is to be expected, it frequently deviates from it in a number of ways in accordance with the prominence of certain symptoms or complications, with the severity of the attack, or with some *peculiarity of environment.* For just as we find that in the case of malaria, phthisis, and every other febrile complaint the influence of locality and race is manifested in the varying types of those diseases, so in the case of typhoid fever it is reasonable to expect deviation, in symptoms and complications, from the accepted standard wherever such modifying influences exist.

I append here an average temperature chart of four typical



AVERAGE CHART OF FOUR TYPICAL CASES OF THE MILDER FORM OF "ROCK FEVER."

cases of milder forms of the Rock Fever. This chart is obtained by adding together the thermometric readings of each respective day of the fever, and calculating the mean temperature of the four cases. A general idea will thus be acquired of the course of an uncomplicated example.

Disturbance of the alimentary system. Of all the features

presented by this fever that which is perhaps the most difficult to reconcile with the view of its enteric nature is the frequent presence and occasional persistence throughout the whole course of the illness of constipation. There can be no doubt that in many of the cases, at least of the less severe cases, there is a tendency to inspissation of the contents of the lower bowel, and also apparently to a defect in the contractile power of the walls of the intestine, yet I have seen few severe cases, where the life of the patient was urgently threatened, in which diarrhœa was not a prominent symptom. Moreover, in all the cases even in those where the fæces are dry, there is a profound alteration in the alimentary secretions, and there is generally, at one stage or other of the disease, a deficiency in the amount of bile voided, accompanied in some cases with slight icteric tinging of the conjunctivæ. It should also be remembered that in typhoid fever, wherever occurring, there is, as a rule, a tendency to constipation in the early stage of the disease.

The Eruption.—In not more than a fourth of the cases that I have observed has the typhoid-eruption been unmistakably noted, yet this fact cannot be regarded as of much importance, if one bears in mind the difficulty of clearly recognising the rose-coloured spots on a highly pigmented skin, associated as they often are with crops of flea-bites. The important point is that in numerous instances, where several members of a household were prostrate with fever at the same time, and to all appearance from the same cause, in some the typhoid spots were present in abundance, in others they were conspicuous only by their absence.

Bronchitis is a common complication, and in the severer forms of the fever it proves most intractable, poultices and expectorants appearing to be entirely unavailing in its treatment. Yet its tendency to run into pneumonia with extensive consolidation of the lung is, so far as I have observed, comparatively slight.

Swelling of the parotid and sub-maxiliary glands, and lymphatic glands of the neck, I have frequently observed.

Rheumatism.—Rheumatic affections of the joints and fibrous aponeuroses is a very frequent complication, so much so that it has been regarded by some as part and parcel of the Rock Fever,

sometimes eclipsing in its severity all the other symptoms combined. It is undoubtedly present in varying degrees of intensity, in a large proportion of the cases, but my own experience of it leads me to regard it as a sequela rather than as a symptom or concomitant of the disease. I have not known it occur sooner than the end of the second week of the fever, and as a rule convalescence has been established before it makes its appearance. It has supervened in several cases of children in which I had taken the most rigid precautions to prevent it, and where I was satisfied that no exposure to ordinary predisposing influences was possible. In degree of severity it may vary from a slight tenderness of the surface of a joint; easily amenable to treatment, to an extensive febrile rheumatic affection difficult to treat, and tending to a chronic form of disease, which results in serious impairment of nutrition, and permanent undermining of the patient's constitution.

I confess I am not prepared to give a full explanation as to why rheumatism should so frequently follow in the wake of this fever, but it seems probable that since rheumatism is a prevailing malady of Gibraltar, independently of fever, those persons whose vitality has been lowered by any protracted illness will be specially prone to contract it. Moreover, although the fact seems to be ignored in many text-books, rheumatism is by no means a rare sequela of typhoid even in England. At a recent meeting of the Clinical Society of London,[1] a discussion took place on the relation between rheumatism and typhoid fever. While some of the speakers held that typhoid fever often follows rheumatism, the President, Sir Andrew Clarke, gave it as his opinion that there exists a close kinship between rheumatism and enteric fever, that in his belief rheumatism often followed on typhoid fever. Other symptoms and complications of this fever do not, so far as I know, differ notably from those usually met with in cases of enteric fever in England, and consequently require no further comment here.

The position, then, which I have been led to take up respecting the continued fever met with in Gibraltar may be set forth as follows:—

(1) That the view held by many that enteric fever is rarely

[1] *Lancet*, April 12th, 1884.

met with in Gibraltar is erroneous; that although cases of ephemeral fever undoubtedly occur claiming a totally different origin from the typhoid poison, the majority of the cases that pass under the familiar term of "Rock Fever" are dependent on this latter cause. (The term *enteroid* might be substituted for *enteric* to mark the relationship of the milder, less fully developed cases with the severer unmistakably typhoid cases.)

(2) That the range of severity in the manifestations of this fever is exceedingly wide, varying from a slight feverish attack of but a few days' duration, to the most virulent and rapidly fatal malady.

(3) That not only are comparatively insignificant cases begotten of the same parentage with severer forms, but also that cases so mild as almost to escape recognition may become the progenitors of the gravest forms of the disease.

(4) That as a rule the disease germs are transported into the system through the atmosphere by the respiratory tract, and less frequently by way of the alimentary canal.

(5) That the apparent inconsistencies in the mode of expression of certain symptoms are to be explained by the modifications of environment, and possibly to some extent also by the unusual channel of entrance of the poison into the system.

(6) That the term "Rock Fever" is an unfortunate one, serving as it does as an excuse against the enforcement of more thorough sanitary regulations and observances.

A word seems necessary regarding the term "Typhomalarial" as applied to this fever by Professor Maclean of Netley. If malarious fever ever were endemic among the inhabitants of Gibraltar, I feel assured that at the present time it has all but, if not altogether, disappeared from among us. I have indeed met with a very few cases of distinctly marked intermittent fever within the garrison, but in each instance I did not fail to discover that the subjects of it were not permanently resident in Gibraltar, and had recently been exposed to malarious influences elsewhere. On the other hand many hundreds of cases of intermittent fever come into Gibraltar yearly from the neighbouring river-districts of Spain, and from Morocco, to obtain treatment at my hospital consultation. So prevalent is ague along the watershed of the river Guadaranqua, within two

leagues of Gibraltar, that I came upon a gang of navvies employed in constructing a railway there, who informed me that not one of their number was free from attacks of the "*calor y frios*," which is their familiar expression for "fever and cold shiverings."

In cases of the Rock Fever I have met with nothing suggestive of intermission or any malarious influence. Moreover, I am interested to observe in Professor Hirsch's *Handbook of Geographical and Historical Pathology*, recently translated into English by Dr. Creighton, a corroboration of the conclusions I had arrived at in regard to this subject, that "Gibraltar, built on rock, enjoys an almost absolute immunity from malarial diseases." [1]

[1] Vol. i. p. 215 (English Translation).

THE PRACTITIONER.

NOVEMBER, 1884.

Original Communications.

HISTOLOGICAL LESIONS OF THE KIDNEY IN ALBUMINOUS NEPHRITIS.

BY DR. V. CORNIL,

Professor of Pathological Anatomy to the Faculty of Medicine of Paris.

(*Continued from* vol. xxxii. p. 167.)

Cystic Kidney.—In other cases interstitial nephritis is accompanied by the presence of more or less voluminous cysts. We have seen several such enormous cystic kidneys which were as large as the head of an infant. Cruveilher and Rayer have figured some very remarkable specimens of them. I have myself published a histological examination of cystic kidneys from a case of M. Dujardin Beaumetz. The two kidneys are generally affected equally, and the patients after having had albuminuria and then anuria, die of uræmia and especially of uræmic coma, which might lead one to believe that they were dying of apoplexy. The external aspect of the kidney is completely changed. The cysts of various sizes all touch one another at their periphery. The contents of these cysts are different, and thus the general colour of the kidney depends on the greater or

less proportion of the colouring matter of the blood contained in the serum of the cysts. This serum may be either as transparent as that of hydatid cysts, or it may be slightly turbid, or it may be brownish or even black; finally it may be semi-solid and friable.

Nearly the whole of the parenchyma of the kidney is thus transformed, and sometimes there is left of it only a few little pieces difficult to recognise by the naked eye. These renal cysts belong to the class of interstitial nephritis. It may be demonstrated that the cysts are due to dilatation of the uriniferous tubules. In fact, on examining microscopically those parts of the kidney which have not yet been transformed into cysts, we see that the tubules are extremely dilated. The cells lining them consist of flattened epithelium and the cavities of the tubules are filled with transparent colloid globules. The cellular investment sometimes becomes detached under the form of a membrane floating in the cavity of the tubule. This membrane is studded with nuclei. The transformation of the cells may be less advanced and sometimes they are simply vesicular, or slightly granular.

The wall of the cyst is composed of connective tissue which is tolerably thick and very vascular in cysts of moderate size, and is very thick and horny in old and voluminous cysts.

In cystic kidneys the interstitial nephritis in those parts of the renal parenchyma which remain is so intense, that one may readily conceive that it is the compression of the tubules by the connective tissue which causes their distension and the formation of cysts.

The large, medium, and small arteries of the kidney are thickened; they almost constantly present in the different varieties of interstitial nephritis the marked alterations due to endarteritis and periarteritis.

The veins are frequently affected with chronic phlebitis and this lesion may give rise to coagulation and cause complete thrombosis.

We frequently see in sections of the base of the pyramids in interstitial nephritis expanded circular figures, filled with connective tissue and retaining in the centre a very small lumen, which sometimes may be completely obliterated. These are

sections of the small veins affected with chronic phlebitis and terminating in a more or less complete fibrous obliteration. We must therefore include the gouty kidney and the kidney of persons dying from chronic lead poisoning in our account of interstitial nephritis.

These two varieties of albuminous interstitial nephritis have many points in common, particularly the deposit of urate of sodium in the form of white opaque islands in the substance of the pyramid. Generally these kidneys are small, and granular on the surface; sometimes they are red, but more frequently the cortical substance is of a greyish or yellowish-grey colour and opaque. The granules themselves are generally opaque.

On microscopic examination we see that the connective tissue of the kidney is chronically inflamed and thickened. At the same time the uriniferous tubules of normal size, which enlarged, constitute the granulations, are usually covered with cells that are granular or undergoing fatty degeneration, and the straight tubules contain hyaline casts in their interior.

As we see, then, the lesions of interstitial nephritis are almost always accompanied by those of parenchymatous nephritis. Finally, in somewhat rare cases of gouty albuminous nephritis the parenchymatous nephritis predominates.

Gouty albuminous nephritis is subject to intermissions; the albuminuria may disappear for a longer or shorter time and again return. The disease may last for a very long time, and at first may neither be very intense nor cause any disquieting symptoms. It has served as a kind of type on which to found the symptomatology of interstitial nephritis.

The symptoms of interstitial nephritis are in reality very variable. We have often seen albuminurias which were referred during life to parenchymatous nephritis because there was much albumen and scanty urine, and because the disease proceeded rapidly to a fatal issue; and yet on post-mortem examination the kidney was found to be atrophied and affected with interstitial nephritis. On the other hand we have seen cases of typical interstitial nephritis with atrophy of the kidney give rise to abundant albuminuria, and terminate fatally within three months. Thus we believe that the symptomatology of the different anatomical forms of Bright's disease, parenchymatous

nephritis, glomerulitis, interstitial nephritis, cysts, &c., is far from being definitely determined, and much still remains to be discovered by close clinical observation.

By this rapid examination of the different varieties of lesions of the renal parenchyma in parenchymatous nephritis and in interstitial nephritis, we have shown how rare it is to meet with purely typical cases in which one element only of the renal tissue is altered.

Parenchymatous nephritis and interstitial nephritis may occur separately from one another, but the former is only found in poisoning by phosphorus, and the latter only in the kidneys of old men affected with atheromatous lesions of the vessels and with chronic inflammation of the renal arterioles.

Between those two extremes there is an uninterrupted series of varieties and of distinct forms, among which all the types of Bright's disease are found. In cases of sub-acute and chronic albuminous nephritis, there are constantly present lesions both of the epithelium and of the parenchyma, of the glomeruli, and of the connective tissue; sometimes the lesions of the parenchyma predominate and sometimes the lesions of the connective tissue, but the anatomical distinction between the different kinds of nephritis which have been called parenchymatous and interstitial, is far from being so marked as people have been in the habit of believing for some years past.

WINTER HEALTH RESORTS.

THE question where patients affected with phthisis, bronchitis, albuminuria, and rheumatism are to spend the winter is always a more or less difficult one. This year it is rendered still more difficult by the presence of cholera in the south of France, and in Italy. It is probable that during the winter the epidemic of cholera which has been prevailing will greatly diminish, even if it do not entirely die away. The risk of a patient's catching the disease by going to spend the winter at Cannes, Nice, San Remo, Mentone, or any of the other health resorts in the Riviera, is but small; even at Hyères, notwithstanding its proximity to Marseilles and Toulon, he is probably quite safe.

The chief health resorts in the Riviera are so well known that when a medical man is asked by a patient where the winter is to be spent he is not unlikely to give at once the name of Cannes, Nice, or Mentone. These places have certainly very many advantages.

Cannes, in addition to its sunny climate and sheltered position, has such a large English population that a visit to it does not in the least savour of expatriation. For those who are well enough there is sufficient society to make the winter pleasant; and, what is a great matter for invalids, English comforts are readily obtained.

Nice is less sheltered than Cannes, and, as we ourselves have experienced, the wind sometimes blows furiously from the hills across the Promenade des Anglais. Its suburb, Cimiès, is, however, an excellent health resort, especially for March and April. There are numberless walks and lovely views. Nice is colder than Cannes, and is less suitable as a health resort for consumptives. It is still more lively, and,

indeed, amusement is carried rather to an excess. But this, no doubt, attracts a number of people who dread boredom above everything else.

A little further east of Nice lies Monaco, the pearl of the Riviera, but quite unsuitable for a health resort on account of the gaming-tables and the crowd of people who resort to it solely for the purpose of gambling.

A little further on still lies Mentone, the best sheltered of all the places in the Riviera, and the best adapted, we think, for advanced cases of consumption where there is little hope of cure, and where one's only wish is to preserve life as long as possible.

Crossing the French frontier into Italy, we come to Bordighera and San Remo, both of which are becoming well known and favourite health resorts. In climate they are not unlike Cannes; San Remo being warmer than Cannes. For invalids who like quiet they are well adapted, but there is not the same amount of stir and amusement as at Cannes.

Within the last few years a number of hotels have been built at some of the smaller villages along the coast with the view of attracting strangers during the winter. Several of these are well situated. Alassio, Ospedaletto, and Pegli, Nervi and Rapallo, have all a good climate and sheltered situation, and may do very fairly well for those who are not great invalids; but from the want of the conveniences which are always to be found where a number of English congregate they are not so well suited to advanced cases of disease as the larger and more frequented health resorts.

It is possible that this year some of these may be considerably fuller than usual, because persons who are afraid of any risk of cholera, and therefore object even to pass through Marseilles, can reach some of the health resorts of the Riviera very readily *viâ* Turin.

Yet small as the risk of catching cholera may be there are many persons whose dread of it is so great that they will object to winter on the Riviera as they might otherwise have done, and their medical attendants must yield to their wishes and send them elsewhere. If the patients dread cholera very much they will probably object, not only to go to the Riviera, but

even to go south at all, and in such cases the Swiss health resorts are almost the only ones to which they can be sent. Of late years the number of phthisical patients who spend the winter in Alpine health resorts has been constantly increasing, notwithstanding the fact that many medical men have still an unfounded dread of sending patients to them. Some of them suppose that it is a case of either " kill or cure," and that unless the patient is strong enough to get well, the intense cold is certain to destroy him. In forming this opinion they quite forget the fact that the temperature of the human body depends very much on the dryness of the air. A very competent Canadian observer noticed that he felt very much colder in London with the thermometer at 4° below freezing-point than in Canada when the thermometer stood at 40° below zero, Fahr. The dryness of the air in Canada more than compensated for a difference of 68° Fahr. Dry air has very little capacity for heat, so that when it is at rest it conducts away very little heat from the body. If fresh particles of it are constantly brought into contact with the surface either by a wind blowing, or by the person moving rapidly along as when driving in a sleigh, even dry air at a low temperature will remove the heat quickly and produce a sensation of great cold. It is for this reason that the chief Alpine health resorts are places well sheltered from the wind. In these Alpine resorts the sky is generally clear and not unfrequently perfectly cloudless. As the intensity of the sun's rays is not lessened by fog or cloud, their brightness and heat is such as would hardly be imagined by any one who has not had personal experience of it. It seems almost incredible that invalids should sit out of doors during the greater part of the day basking in the sun and shading their faces with a parasol or umbrella, while all around, as far as eye can reach, there is a dazzling sheet of pure white snow, broken only by the jagged outlines of projecting rocks, or the dark forms of leafless pine-trees. Even in the hotels the cold is not so much felt as it is in London. The public rooms and corridors are warmed either by stoves or hot water-pipes, and the private rooms also are heated either by stoves or by hot water. Rooms facing the north are apt to be cold, but in rooms having a southern exposure the occupants frequently do not light their

stoves until the afternoon, as the sun's rays shining into the room warm it sufficiently during the forenoon.

The chief Alpine Swiss resorts are Davos and St. Moritz. Two others are likely this year to obtain a share of patronage—Wiesen and Maloja. There has been an hotel at Wiesen for one or two years, but it has recently been considerably enlarged. The hotel at the Maloja is open for the first time this year.

Davos is the oldest and best known of these health resorts. It is situated in a narrow valley which is so closed in, not only at the sides, but at the ends, that there is very little wind indeed: and thus the patients are less exposed to the chance of a chill. There are a number of hotels. Those chiefly frequented by the English are the Buol and the Belvidere. The Kurhaus and its *dépendences* are chiefly frequented by Germans.

The chief amusements of the more delicate are reading, gossiping, and basking in the sun, or gently strolling along the road, where seats are provided at short intervals on which they may sit down and rest whenever they feel tired. For the stronger there are excursions in the neighbourhood, skating on the rink, and tobogganing. The toboggan is a little sleigh about four feet long, and varying in height from a few inches to a foot or rather over it. Having drawn this to the top of a slope, the person seats himself upon it and glides down to the bottom with great rapidity, guiding himself either by his feet or by a wooden pin held in each hand. At Davos the chief toboggan run is behind the hotel Buol, but those who are more athletic have a long run down the hill from Davos Dörfli, which is about a mile and a half from Davos.

Davos Dörfli lies further down the valley than Davos, or, as it is sometimes called, Davos Am Platz, to distinguish it from Davos Dörfli. Dörfli is not much frequented by English, but there are a number of hotels which appear to be well filled.

The advantages of Davos as compared with the health resorts of the Mediterranean are, that it is more bracing, and that the air—at least that outside of the hotels—is free from dust, which we now begin to associate so closely with disease; and

that the rarefaction of the air appears to lead to greater expansion of the lungs. The coldness of the air induces patients to take more exercise than they would probably do in southern climates, while the warmth of the sun and the intensity of the light probably act as vital stimulants. To those who are unacquainted with Alpine health resorts, it may seem exceedingly strange to rank them above the Mediterranean resorts in relation to sunshine, but such is nevertheless the case, and any one going from the Mediterranean to Davos or St. Moritz will be struck by the fact that the inhabitants of the latter places are much more sunburned than in the former; and even patients who are far advanced in phthisis, instead of a pallid look, often present an almost nut-brown colour in the Alpine Swiss health resorts, from the intensity of the sun's rays pouring down through a cloudless sky, increased by the upward reflection from the pure white snow.

The advantages of Davos as compared with other Alpine health resorts are the complete shelter which it enjoys from wind and the greater readiness with which it is reached. By travelling to Switzerland *viâ* Laon and Delle, the invalid is able to leave London at ten o'clock one morning and get to Basel about six the next morning. By travelling in a sleeping carriage he has no change between Dover and Basel, and may enjoy a comfortable night's rest. At Basel he has nearly an hour and a half's stoppage for breakfast, and gets on to Landquart a little after two in the afternoon. Here he stays all night, and next morning he travels either by diligence or by private coach up to Davos. The diligence takes seven hours and a half between Landquart and Davos.

Instead of going on to Landquart, some patients prefer to stop at Ragatz, which they reach about ten minutes to two, and, resting there all night, catch the diligence at Landquart in the morning, or else hire a private carriage. Others, again, prefer to travel by Chur, which they reach at 2.35 in the afternoon. The hotels, both at Ragatz and at Chur, are larger than at Landquart. The journey from Chur to Davos by diligence is longer than from Landquart, but by starting at eight instead of ten in the morning one arrives at half-past four instead of half-past five in the afternoon. When an invalid wishes to stop at an hotel

during winter a telegram should be sent on to the hotel-keeper to have the invalid's room not only ready but thoroughly well warmed beforehand.

St. Moritz is the best known winter resort, next to Davos. Although in summer it is usually crowded with strangers who are attracted to it either by the beauty of its scenery, or by the reputation of its chalybeate springs and bath; it is only within the last two years or so that it can be said to have become a regular winter resort for invalids. For some years, several people have been in the habit of spending the winter in St. Moritz, but these were chiefly persons in comparative health, fond of walking and mountain excursions. St. Moritz is now, however, coming rapidly into favour as a health resort for phthisical patients. Although about 6,000 feet above the sea level, it is like Davos situated in a valley. But there is this difference between the two valleys; that while the Davos valley is closed in at both ends, as well as at the sides, so as to form an elongated cup, St. Moritz lies near the upper end of the valley of the Engadine, which stretches away eastward, gradually descending for many miles. St. Moritz would thus be much exposed to wind, were it not that moraines, stretching from the hillsides into the valley above and below it direct, any current of wind passing either up or down the valley away from it, so that it is well sheltered although not quite so much so as Davos.

The Engadine valley begins about fifteen miles above Davos at the Maloja Pass. Its upper part is cut up by moraines into a series of cups in each of which lies a little lake. This series of lakes forms the head waters of the Inn, which, as it leaves the St. Moritz lake, is a small stream a few yards across, but, gradually increasing in size in its onward flow, has become a deep and rapid river when it joins the Danube at Passau. The baths at St. Moritz are situated on the flat ground at the head of the lake, and here also are several large hotels which are frequented by the summer guests. These are at present entirely closed during the winter months.

The chief hotels which are open during winter are the Kulm Hotel and Casper Badrutt's Hotel, but probably some other hotels may be open this winter to accommodate the influx

of visitors. The two hotels just mentioned as well as several others are situated on the side of the hill, at a distance of nearly 300 feet above the lake. The advantage of this is, that they are completely above the reach of the mists which may frequently be seen hanging over the lake, especially in early morning. They are also well sheltered from the wind by the projecting spurs or moraines already mentioned. While Davos has an advantage over St. Moritz in being better sheltered and rather more easily reached, St. Moritz has an advantage over Davos in several respects. It is more lively and more agreeable because it is not, as yet, a resort crowded with invalids. The weakness, weariness, discomfort, and pain, consequent upon illness are apt to render invalids irritable, and their irritability has a tendency to communicate itself to those who are around them, nursing them or caring for them. The very self-restraint which healthy persons exert in order to bear an invalid's fretfulness or exactions, without the least indication by word or look of weariness and annoyance, is apt to render them occasionally irritable and captious, while the sorrow for their friends is apt to exercise a depressing effect. A society composed chiefly of persons who are very ill and of those attending upon them, such as that at Davos, is, therefore, not so likely to be pleasant as one of people comparatively healthy such as we find at St. Moritz. The opportunities for exercise at St. Moritz are also better. The skating rink is only about fifty yards from the Kulm Hotel, and the lawn-tennis court is only about ten or twelve yards from the hotel. There are several toboggan runs :—one, a short one, from the hotel door down through the village ; a long one from the hotel terrace down to the lake ; and another down a steep footpath leading to the village of Cresta.

The nearness of the skating rink and lawn-tennis court to the hotel, induces those to make use of them who would be deterred from doing so by a walk of even a few hundred yards. There is the further advantage that invalids who are too weak to take any active exercise, are able to sit in the court or on the rink during a great part of the day enjoying the sunshine, while they are amused and interested by watching the sports. Arrangements are made by which it is unnecessary for them to come in to meals, their luncheon being brought out to them. Both

the rink and the tennis-court are so well sheltered from wind, that although fully open to the sunshine, invalids can sit out on most days without the least risk of chill. Some patients even far advanced in consumption have done very well at St. Moritz, but probably the cases for which it is most suited are those where the lungs are simply consolidated, or where softening is at least not far advanced, and the patient retains a sufficient amount of energy to enable him to take active exercise out of doors. We have seen cases of simple consolidation clear up at St. Moritz in a way which was really marvellous, and we think more rapidly than at any other health resort. Even moderately-sized cavities contract and heal up.

St. Moritz is somewhat further than Davos, the difference in distance being chiefly in the diligence journey. The traveller may take the route already mentioned to Chur, leaving London at ten o'clock, and arriving about half-past two the next day. He may rest at Chur all night, and take the diligence or a private carriage up to St. Moritz. The diligence leaves at a quarter-past five in the morning, necessitating an uncomfortable start for invalids. It arrives at St. Moritz at a few minutes past six at night. This early start may be avoided if the traveller instead of staying at Chur all night should take a carriage on to Thusis and sleep there. The diligence starts at twenty minutes to eight in the morning, arriving at ten minutes past six at St. Moritz. By this plan also the long diligence journey is shortened and the fatigue to the invalid is lessened.

Wiesen has for a few years back been used as a stopping place by invalids on their way down from Davos. The spring there is earlier than at Davos, so that when the snow begins to melt at Davos, and makes the roads sloppy and uncomfortable, it is already so far melted at Wiesen that the hillsides exposed to the sun are free from snow. It is not so well sheltered from the wind as Davos, nor has it the same advantages for exercise as St. Moritz, but the hotel is comfortable, the cooking is said to be good, and several people who have been staying there speak very highly of it. It is also less expensive than Davos or St. Moritz.

Invalids going to Wiesen stop all night at Chur, and leaving

by diligence at eight in the morning arrive in Wiesen at twenty minutes past two.

A new hotel has been opened this year at the Maloja as already mentioned. From the Maloja pass the Engadine slopes very gently down towards the north-east, while on the other side the ground falls abruptly nearly a thousand feet into the Val Bregaglia, the diligence road descending in many windings down the declivity of one of the steepest mountain passes in Europe. Close to the summit of the pass on its eastern side lies a lake, the first of the series, in the Engadine valley. At the head of the lake between it and the summit of the pass is some flat ground, and on this is built an enormous hotel.

Although the Maloja is fourteen miles higher up the Engadine valley than St. Moritz, yet the slope of the valley is here so gentle that the Kulm Hotel at St. Moritz, built as it is on the hillside, is actually higher than the Maloja Hotel. No expense has been spared in constructing this new hotel. The rooms are all heated by warm air. As the hotel is built on the flat ground close to the head of the lake, there must be some risk of malaria, and consequently the openings in the external wall through which the air enters the hotel have not been placed near the ground, but are at the level of the first floor. Through these openings the air is drawn in by a huge engine, and made to pass through a number of pipes lying in hot water, and then up to the rooms. By warming the air with hot water any risk of admixture with unpleasant gases is avoided. There are arrangements in each room by which the supply of hot air can be regulated, so as to keep the room at the temperature desired by its inmate. The public rooms are large and spacious; and besides the general salon, there are several small public sitting-rooms on the upper floors for the convenience of invalids who do not feel inclined to visit the salon, and yet do not wish to incur the expense of a private sitting-room. While everything has been done in the construction of the hotel to insure success, experience is required to show whether the Maloja will prove quite satisfactory as a winter health resort. From its position so close to the level of the lake, it is likely to be frequently enveloped in fogs, the absence of which at the St. Moritz Kulm is such an advantage. A great deal will depend upon the

management of the hotel, and more especially upon the cookery. If the food is good, and if the cooking is such as to suit English tastes, and especially to suit the delicate palates of phthisical patients, the Maloja will probably prove successful in spite of any drawbacks in the way of fogs. A skating rink and tennis court have been provided, and the diligence road zigzagging down the pass into the Val Bregaglia forms a magnificent toboggan run.

Besides these Alpine resorts there are other Swiss wintering places on the lake of Geneva, such as Montreux, which do not possess the same advantages as the Alpine ones, but have a character of their own more resembling that of health resorts on the Riviera. Among the French health resorts which can be reached without going near any district infected with cholera are Biarritz, Arcachon, and Pau: besides these some of the health resorts more usually resorted to for rheumatism might be available also for phthisical patients, such as Dax.

The chief Spanish health resorts are Malaga and Seville. Seville is considerably colder than Malaga, and is hardly to be recommended for phthisical patients, but patients who are simply delicate and who dislike wintering in this country, might comfortably spend some months at Seville. The cooking, in some of the hotels at least, is fair, though not usually so agreeable to English palates as it is in France. There is a considerable amount of sunshine, and the place itself affords a sufficient number of objects of interest to prevent one from being thoroughly wearied.

Malaga is situated on a bay on the south-eastern coast of Spain, and the hills rising behind it shelter it from the wind. Malaga is sunny and warm and bright, but there are several serious objections to it: these are the discomfort of the hotels, the abominable cooking, the lack of objects of interest, and the difficulty of getting to it and away from it. On the hillsides towards the north-eastern end of the town there are some lovely gardens, and if some enterprising hotel-keeper would take or build a house amongst them, and keep a good cook, invalids might be tempted to go. Standing on the terrace of one of those houses and looking towards the bay the view is most lovely, so that one might fancy oneself in paradise, and if one had

comfortable rooms and palatable food, the temptation to winter in Malaga might be great despite the difficulty of reaching it. One can travel to Malaga either by land or by sea. The route by land necessitates a very long railway journey of thirty-six hours from Paris to Madrid, twelve hours more to Cordova, and of six hours and a half more to Malaga. Such a long railway journey as this is too fatiguing for any invalid. By sea, one reaches Gibraltar in about five days from England by the Peninsular and Oriental boats, and so far even invalids may travel in tolerable comfort. But if they attempt a voyage in one of the small steamers which ply between Gibraltar and Malaga, they will probably have a trial before them such as no invalid should be subjected to, and they ought to wait for the large boats belonging to the *Compagnie Générale Transatlantique.* Mogadore, further along the coast to the south, has been highly praised, but the difficulty of reaching it makes it practically unavailable.

Tangier on the African coast opposite Gibraltar is much more easily reached, and is, upon the whole, an exceedingly satisfactory health resort. The invalid travels to Gibraltar by the P. & O. boat, and although the steamers between Gibraltar and Tangier are but small, the passage only lasts a few hours. The situation of Tangier is lovely: the town is built in a sort of amphitheatre fronting the sea, and the white houses rise tier above tier almost from the water's edge. The streets are narrow and dirty. The hotels in the town are by no means very good, and although persons in health might bear with them, they are not to be recommended for invalids. Bruzeaud's Hotel outside the gates is highly to be commended.

It is built in a garden on the hill outside the city, and one may go from it right out into the country without coming near the town. The rooms are comfortable, and the cooking is good. The new part of the hotel, which was only finished a year or two ago, has ample means for warming the rooms, and is built upon a thick layer of charcoal so that no malarious or disagreeable emanations can rise from the soil. Donkeys or horses may be hired for riding into the country, or for a gallop on the sandy beach which extends for a couple of miles or more round the bay. There are a number of walks suitable even for delicate people.

The downs behind the castle form a pleasant promenade with an extensive view, and some of the gardens belonging to the consulates, and freely open to visitors, are charming. Even those who are unable to walk can find considerable amusement, especially if they have a good field-glass or telescope, by watching the long caravans of camels coming in from the country, or the Arab encampment just outside the gate. The town itself is thoroughly Eastern, with narrow and dirty streets, and a good deal of amusement may be got by strolling through it and by visiting the bazaars, where one can spend a great deal of time in bargaining for goods and yet spend very little money. If Tangier were better known it would probably be much more commonly resorted to than it is.

Algeria is another health resort likely to be a good deal visited this winter. Although steamers are constantly running to it from Marseilles, Algiers has remained free from cholera. A few doubtful cases have been reported at Oran, but none at Algiers itself. Algiers, like Tangier, is built on the side of a hill facing the sea, but it has a much more extended frontage, and while the limits of the town are tolerably sharply defined towards the west, it stretches away towards the east in numerous villas forming the suburb of Mustapha Superieur. Most of the hotels are situated in the town, and these are frequented by travellers or by persons who stay only for a short time, but those who intend to spend the winter either try to get rooms in the hotel or in the boarding-houses at Mustapha Superieur, or else hire a villa for themselves. Some invalids, instead of staying in the town or at Mustapha all the winter, make occasional excursions out in the country, spending a little time at Blidah or at Hammam R'Irha. The hotel at Blidah is very comfortable, and the orange gardens in the neighbourhood are worthy descendants of the gardens of the Hesperides.

We have already given a detailed description of Hammam R'Irha (*Practitioner*, vol. xxvi. p. 241). A new hotel has been built there, and was to have been quite ready at the beginning of last winter. Owing partly to the large scale on which it has been projected it was not perfectly finished, and the heating apparatus was deficient. This year, however, we learn that a considerable part of the hotel has been quite finished, and, if this be so, we

can fancy few pleasanter places to stay at than Hammam R'Irha.

The disturbed state of Egypt may perhaps prevent some from going to it, while others will be attracted by the knowledge that so many of our fellow countrymen are there at present.

Cairo itself is not a very good place for consumptive patients to spend a winter in, although it is usually warm and very dry, yet it is dusty. The best plan is to get a dahabîyeh and spend the winter on the Nile. The disadvantage of this, is that it is expensive even if several join together to take a boat, and extremely so for any one to go alone. There is a hotel at Luxor (Thebes), and here an invalid might stay, but this hotel is far from being a quiet one as it is much used by tourists going up and down the Nile in Cook's steamers. There is another hotel at Heluân about an hour south of Cairo by rail. This is built on the edge of the desert, and for climate leaves, perhaps, but little to be desired, but the last accounts we had regarding its management were not satisfactory.

Rome and Florence will probably be frequented as usual this year by numbers of persons who are delicate and feel the winters here dry, but who are not consumptive.

Pisa, although a good deal frequented by Germans suffering from phthisis, is not nearly so good as the Riviera, Algiers, or Switzerland, for the climate is damp and relaxing. Persons with irritable throat and irritable nervous systems, however, may do well at Pisa.

For information regarding long sea-voyages we must refer to the admirable articles by Dr. C. Faber in the numbers of the *Practitioner* for March, May, July, August, and September, 1876, and October and November, 1877; and for information regarding Australasia, South Africa, and South America, to the articles by the same author in the numbers for January, May, November, and December, 1878; and by Mr. Leach, September and October, 1878. Peru as a health resort is described by Dr. Dickson Hunter in the *Practitioner* for November, 1881.

Capri possesses many advantages (*Practitioner*, vol. xxiv. p. 112), but the presence of the cholera at Naples will deter many persons from visiting it.

Before concluding this article it may be well to give a few

words of general advice to invalids who are travelling. One of the discomforts of the long railway journey which is required in order to reach most health resorts is the constant vibration and the fatigue it occasions. This may be, to a considerable extent, avoided by the proper use of air cushions. It is well for an invalid to be provided with two or more of these. The one to be used for sitting on may be either round or square, and may be either with or without a depression in the centre. Air cushions of a horseshoe shape and furnished at the ends with tapes so that they can be opened out, and again tied together, are most useful. One of them tied round the loins supports the back, and another put like a collar round the neck supports the head, so that in whatever position it is put, sideways, backwards, or forwards, it always rests against the cushion. It is very annoying if one begins to get tired and sleepy and wishes to rest the head against the side or back of the carriage, to feel the vibration going through and through it, until in desperation, one is obliged to sit bolt upright again. The use of a horseshoe air-cushion completely remedies this discomfort. When sleep comes on and the head begins to nod, it is always supported, in any position, by the inflated horseshoe, and if one has in addition an air pillow which may be inflated to a larger size than the ordinary cushions, one may, if the carriage is not crowded, stretch one's self along the seat and enjoy a comfortable sleep. Even if one is upright, by putting a cushion or pillow against the side of the carriage, one may get a comfortable sleep, as the pillow supports the temples and it is prevented from slipping down, as it would otherwise readily do, by the horseshoe cushion round the neck. Another comfort to invalids travelling, is an indiarubber bag for hot water with a flannel case. Indeed it is well to have two of these if the invalid be very delicate. If any sudden chill is felt, or if any pain in the chest or elsewhere should come on, relief is often obtained by the application of a hot-water bottle which takes the place of a poultice. The invalid's friend can easily get these bottles filled with hot water by giving a small gratuity to the guard of the train and asking him to fill them when stopping at a station. Stoppages occur on the French lines at least every two hours, and the water retains its heat quite long enough to make it

useful between the stoppages. Another thing which is a great comfort to invalids is an eider-down coverlet, which should be both long and broad. It is useful, not only during travelling by land or by sea, but during a stay at the health resort. Chills always occur whether the invalid be staying on the Riviera, in Algiers, in Egypt, or Switzerland, and then a warm covering is of advantage. It is perhaps more likely to be wanted, indeed, in the southern health resorts than in Switzerland, for in the Alps more care is taken to heat the interior of hotels. On a dahabîyeh on the Nile the cold during the night may be considerable, and the same may be said of the Riviera and Algiers. Sometimes too, if the sun has been warm, fires and stoves may not be lighted, a sudden change of temperature takes place, and the invalid begins to suffer from a chill; but if he has at hand a large eider-down quilt in which he may completely wrap himself, the chilly feeling soon passes off, and he may thus not only save himself from great discomfort, but from permanent injury. One would imagine that an eider-down quilt would be bulky and inconvenient to travel with, but this is not the case. In most "hold-alls" there is a large pocket, and the eider-down quilt can be readily rolled up and put into this pocket. When the straps are once around it, it can, from its softness, be easily pressed into a small bulk.

Two other things that the invalid should not be without are a small etna, with can or kettle, to boil water, and a small package of tea. Brandy is an article usually to be got at an hotel, but one cannot always immediately get hot water, and in case of a chill, the brandy mixed with the hot water is much more efficacious than the brandy alone. Tea which is fit to drink is by no means always to be had, and it adds greatly to the invalid's comfort if he has the means of making himself a cup of tea whenever he wants it. By taking also a few skins of Brand's beef-tea, or pots of Liebig's extract, with a small box of biscuits, he can have a slight but refreshing meal on coming back from a walk, and thus prevent or remove any exhaustion which he might otherwise feel. Even when such things are to be had at a hotel, the prices put upon them are sometimes so exorbitant that the invalid would hardly care to order them, however much he might desire them.

MALT-EXTRACTS AS FOOD.

BY J. MILNER FOTHERGILL, M.D. EDIN.

THE use of malt-extracts is the direct outcome of the practical aspect of chemical knowledge in its bearing upon clinical medicine. The chemist observed that in the process of malting the starch of the barley underwent precisely the same change as does starch in the human mouth, viz. a conversion of the starch into grape-sugar under the action of a ferment (diastase). The identity of the change led to the utilisation of the diastase of cereals for the needs of human infants where the digestion of starch is defective. Hence the numerous malt-extracts now on the market.

By admixture with farinaceous food before being eaten, or by being taken practically simultaneously with such food, or before the stomach has become distinctly acid in the digestive act, malt-extracts have been found highly useful in the conversion of starch into grape-sugar. But it is not with this *diastasic* value of malt-extracts the present paper is engaged, but rather with their value as food *per se*.

In the malting process the starch of the grain is more or less converted into grape-sugar; probably some is converted into maltose, while some is less completely acted upon but is put forward some way towards grape-sugar. In addition, however, to this amyloid metamorphosis, the albuminoids of the grain, and the mineral salts thereof, are retained in a soluble and highly digestible form in malt-extracts. As a consequence malt-extracts form a most useful food where the digestion is gravely impaired,—whether in infants or in adults. They constitute, indeed, a food of a highly nutritious character in small bulk, and therefore available when the stomach resents the presence of any bulk of food, as the following case illustrates.

Mrs. C., a middle-aged woman, with a very tetchy stomach at the best of times, had it decidedly upset, with the result that she was rapidly wearing out by starvation. Of the few things she could take the medical man in attendance had tried every one, and left me no solitary arrow to fire except malt-extract. She was ordered a teaspoonful of malt-extract every hour. The stomach tolerated it famously, and she got quite well. Her husband wrote to me sometime ago (in answer to an enquiry in reference to the present paper): "Mrs. C. lived *entirely* on the malt-extract for about two weeks, and then she was able to take other food in small quantity, and continued the malt-extract, feeling well satisfied with it." (After six months.)

In another case, where the patient had been discharged from a metropolitan hospital for cancer of the stomach, and where that viscus could be felt contracted into a ball like a cricket-ball, all food was rejected more or less completely. As it was clear the food must be small in bulk as well as nutritive in character, I advised the Cremor Hordeatus Loefflundi (cream deprived of much of its water and preserved by malt-extract) in a small quantity—about the size of a filbert—every hour; with the result that the patient rallied, and "was much better." Three months later she was still holding her own.

With many patients the malt-extract is relished; but unfortunately other stomachs rebel against it, but these last are a minority in my experience.

It is not, however, in such desperate cases only as the above that malt-extracts as food are of avail to us. In many cases where the digestive powers are very feeble, and where—to use their own expressive language—the patient complains, "I cannot eat enough of food to make me strong, and if I could I could not digest it," malt-extract as a food requiring a minimum of the digestive act is very useful. It can either be taken alone or added to some warm milk. In such form it can be taken an hour, or an hour and a half, after a meal, in many cases with advantage. Especially when some food is required in the course of the night is this admixture of milk and malt-extract of service. (It can be prepared at bedtime and kept near the bed in a hot-water jug—the lid preventing any taint of the room—and be kept warm under a cosey.)

Not only are these malt-extracts foods of high value in certain cases, but other foods prepared by the malting process are useful. One of these is the well-known Mellins's food for infants, a most palatable preparation. Another is Liebig's malted food extract; not nearly so toothsome. Doubtless there are many more, but these will serve to illustrate my meaning. Such foods can be added to milk with great advantage in many dyspeptic conditions.

Though not quite appertaining to the present paper it may not be out of place to allude here to the many prepared foods for infants now sold, and which are equally good for dyspeptics. They consist of flour which has been subjected to a high temperature. That is the main fact to remember. In its solubility in the digestive act there is all the world of difference betwixt raw uncooked flour, and flour which has been previously cooked, as prepared food, or baked flour. Such cereal matter can be added to milk, to beef tea, or made into puddings, with the greatest advantage. Farinaceous matters of this "baked" flour order are especially indicated where the digestion of starch is feeble, whether malt-extracts be used therewith or not. By the combination of the two excellent results can be attained in cases of grave indigestion. In the case of a lady who came over from the United States of America to consult me about her digestion, the result was most satisfactory, being beyond her expectations. Many other cases could be mentioned, but two must suffice.

Miss M., a spinster, seen along with Dr. Walker, of Peterborough, was put upon the dietary suggested above. One month after this the report was, "She seems a little better and thinks herself so. She still sticks to the cremor and the malt, and says she dare not take any solid food. Her sickness is much better, also the pains."

After the lapse of other six weeks she herself reports "I am going on quite as well as you led me to expect. I have made no material change in your dietary all this time, and thoroughly enjoy it." The last is a great matter, for dyspeptics as a rule loathe the food they ought to eat: and when they do not do so, the dietary is apt to become wearisome from its monotony, as it does not allow of much variety. She also alludes to the

freedom from pain which she now experiences as compared to what she had before this line of treatment was adopted. Partial success is all that is attainable in this case; but the patient is much more comfortable than she was.

In another case seen with Dr. Henderson of Coldstream, the limits of indigestion compatible with bare existence had been reached. The patient, a female of twenty-one, had been subjected to a long course of semi-starvation, with the result that the digestive powers were grievously impaired. The patient was confined to bed almost from sheer debility. She nearly fainted when being examined. She could take but very little food, and diarrhœa was readily provoked. She was put upon a dietary of milk with malt-extract, and Mellins's food, with a small opium pill night and morning. After six weeks Dr. Henderson wrote as follows: "I am attending our patient, and am glad to say that the new line of treatment has made a wonderful change in her health, though the diarrhœa still continues at times, which of course weakens her somewhat." Considering that the morbid condition had lasted about two years when I saw her the result was a satisfactory one. From a letter received as this article is going through the press it seems the improvement is maintaining. The doctor writes me, "She feels much stronger, and says that at times she really feels much better. She gets up now for some hours almost every day, and takes a certain amount of exercise. If her diarrhœa were only perfectly got rid of, my belief is that the new treatment of feeding would make a very rapid cure. When she commenced the extract of malt this left her; but there is always a tendency that way. She has taken a fancy to the malt, and quite enjoys it." So that two patients at least positively like the dietary. This last case is one gratifying alike to the patient and the medical attendants.

To these two illustrations may be added a case in Victoria Park Hospital.

The tongue raw in patches was only one of the sinister symptoms a girl exhibited when taken into my wards. Knowing the danger involved in these cases (with even a guarded dietary) of setting up diarrhœa, which goes on to tuberculous ulceration of the bowel—from a bitter experience—I ordered her milk and malt-extract, and nothing else. I went off on my

autumn holiday without any hope of seeing this patient again. To my surprise and satisfaction, on my return, she was not only alive but considerably better. The dietary had been continued with military obedience, with the best results. But it was certainly monotonous, so I allowed her a little boiled white fish. This disagreed, and she had to go on with the old dietary, on which she continued to improve.

So much, then, for malt-extracts as food. Malted foods differ from malt-extracts in that the diastase is killed by the heat employed. As food they are about as good as malt-extract; but they possess no diastasic power.

Further, in cases where ordinary sugar undergoes acetous fermentation in the stomach, malt preparations are indicated. Sugar is a main source of fat, and is indicated in all cases of emaciation. In his admirable little work on *Materia Medica and Therapeutics*, Dr. Mitchell Bruce makes this important statement:—

"Maltose is a form of sugar which does not ferment, and will not give rise to acidity and dyspepsia." In the sadly numerous cases where acidity is caused by ordinary sugar in malt-extract and malted preparations we find a sugar of the highest utility in practice as not liable to acetous fermentation.

It is hoped that the experience here recorded will encourage other medical men to make use of malt-extracts (and their allies) as food in cases of deficient assimilation.

FACIAL NEURALGIA TREATED BY NERVE VIBRATION.

BY WILLIAM H. NEALE, M.D. LOND.

FACIAL neuralgia is such a painful disease that patients will submit to almost anything in order to obtain relief from the pain. The cases recorded by Mr. Walsham in the July number of the *Practitioner* this year are exceedingly interesting, and the results he has obtained by stretching nerves are very satisfactory. At the same time one is naturally anxious to try every simple means of relieving the pain before advising one's patient to submit to an operation, and the success obtained by nerve vibration in the following case may render it interesting to readers of the *Practitioner*.

A.B., aged 35, policeman, came under my care on June 3rd, 1884, complaining of neuralgia of the head and face. His history was briefly this:—He had been married five years, had two children, one living and healthy, the second died when about a week old of bronchitis. His wife has never miscarried. He has always been very temperate, was in the army from 1864 to 1876, served in India from 1868 to 1875. Since 1876 he has been in London, and in the police force. He is a well-made man, 5 ft. 10 in. in height, fair, with an expression showing he is subject to considerable attacks of pain. His father died of cancer at the age of 56, and his mother in a fit when 54 years old; he has one brother and three sisters, all living and healthy. When in India patient had a slight attack of gonorrhœa, which lasted about ten days. No history of syphilis. Patient says he never had a day's illness in his life until December 1878, when the present complaint commenced. He was out one wet night on duty, in December 1878, wearing

a broken helmet ; the rain dropped unceasingly through a hole in the top of his helmet on to his head just at the spot marked $(+a)$ in diagram. The next morning he complained of neuralgia of right side of head, starting from the spot on which the water had dripped. For many days he suffered considerably and was seldom free from pain during the winter months, though he was under treatment all the time; since 1878 he has suffered with similar attacks every year. In January 1884 the old pain returned, commencing in the right side of the head, spreading to the right eye, and down the cheek. From January to June there has hardly been twenty-four hours free from pain; every time patient attempts to eat or drink he receives a sharp twinge, and for many hours every day his life is a burden to him. Drugs have been tried during the last four months, amongst them potass. iodid. to full doses, quinine, potass. bromid., ammon. bromid., ammon. chlorid., sodæ salicyl., croton chloral, colchicum, but nothing has given permanent relief.

On June 7th I decided to abandon all drugs, and induced the patient to give percussion a trial. I used the small, flat ivory disc, with about ninety vibrations to the second, and applied it to the spot marked $(+a)$; the pain was intensified at first, but after about five minutes' constant application the patient said the pain was gradually leaving him, and in two or three minutes more there was no pain at all in side of head. I then moved the disc along the forehead, but found no painful spot until it was placed under the right eye, just where the infra-orbital branch of the superior maxillary nerve emerges from the infra-orbital foramen; at this spot patient complained of severe pain, and the right side of the face was drawn up for more than a minute; the muscles then gradually relaxed, and the pain soon disappeared. I went on applying the disc until the pain had quite left, and then sent the patient home, telling him to keep a note as to how long he was free from pain.

June 8th, 3 p.m.—Patient reports that he was free for nearly six hours yesterday, but that in the evening he suffered as much, if not more, than usual; he cannot take food or drink without agony; even talking increases the pain. The percuteur was applied to the same spots as yesterday with similar results.

The diagram shows the various tender spots found out by

running the percuteur lightly over the skin. When the spots were touched the patient immediately called out, and the application was continued until the pain died away. Each spot has the date attached on which it gave signs of pain with the percuteur.

June 9th.—Patient was in good spirits to-day, having had more relief during the last twenty-four hours than he has experienced for months. The disc was applied to the two spots

dated 9th in the diagram, where its application soon deadened the pain.

June 10th.—There has been no pain in the head since yesterday; it seems to be concentrated under the right eye, and on the right side of the nose (see diagram). Three spots were touched to-day with the percuteur.

June 11th.—The spot under the eye has been free from pain,

and was not touched to-day; a fresh spot, however, was detected on the cheek, which, together with two of the spots which were percuteured yesterday, was also touched to-day.

June 12th.—Patient reports himself as much better to-day. Three spots were percuteured.

June 13th.—Only one tender spot on cheek and one over the right eye were detected by the percuteur, to both of which the disc was applied for seven or eight minutes.

June 14th and 15th.—Patient was prevented from attending both these days.

June 16th.—Patient came in a great state of despondency, wishing to abandon the treatment; he had hoped for so much at the beginning, and to-day he says the pain is worse than ever. On enquiry it was ascertained that domestic troubles, changing apartments, &c., together with a heavy day in court, had caused him to have no rest for two nights, and to neglect food. Being persuaded to use the percuteur, it was found that many of the originally tender spots were still free from pain, but that the one under the right eye was as painful as ever, together with two others, one on the nose, the other on the upper lip. Percussion was applied to the spots until no pain was felt. The patient left very cheerful, and again promised to attend daily at 3 p.m.

June 17th.—After yesterday's application there was no pain for eighteen hours, but this morning, on washing his face, the pain returned. To-day three spots were percuteured, advice being given to abstain from washing the face for a day or two.

June 18th.—More than twenty hours free from pain after yesterday's application. To-day patient has a bad attack just come on, the right eye is much injected, tears are running down the cheek, and he seems in a great deal of pain. Three spots very sensitive to percussion, but after fifteen minutes' constant application there was not a trace of pain left; the tears left off running, the conjunctiva became paler, and the patient looked a changed being.

June 19th.—Patient unable to attend to-day.

June 20th.—For more than twenty-four hours there was no return of pain; but last night and to-day the pain has been again very severe, especially on taking food, &c. There are

three painful spots to-day, the side of the nose being excessively tender.

June 21st.—During the last twenty-four hours there have only been a few slight twinges of pain.

June 22nd.—Patient has only felt the pain twice during the last twenty-four hours. Percuteur applied to two spots.

June 23rd.—The pain has almost entirely gone.

June 24th.—Patient has been entirely free from pain for twenty-four hours, but the disc caused a return of it when applied to the two spots marked in diagram for the 24th. A very few minutes' percussion served to dismiss the pain.

June 25th.—No pain since yesterday. Percuteur applied to two tender spots, causing just a sensation of pain.

June 26 and 27th.—Patient quite free from pain. No application.

July 18th.—Since last note there has been no return of pain.

August 15th.—I saw the patient to-day, he has never had a twinge of pain since he left off attending for the percuteur; he looks a happy, cheerful man, and says he has not felt better for many years.

Oct. 24th.—The patient still continues well.

THE TREATMENT OF PHIMOSIS WITHOUT OPERATION.

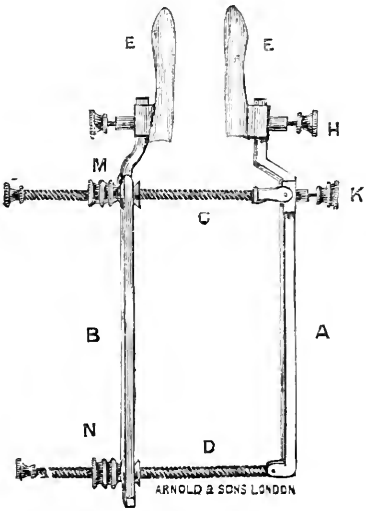
W. STEPHENSON RICHMOND,

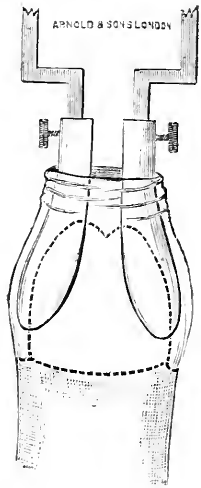
St. Bartholomew's Hospital, London, E.C.

The only method of treating phimosis, in common practice, is by operation. There are, however, a great many patients suffering from this malady who absolutely refuse to undergo any operation for its relief. Numbers of cases are constantly presenting themselves of men considerably advanced in years who have never been able to get their foreskins back, and have consequently suffered continually from discharges attributable solely to the irritation attendant on this condition. Yet many such patients will rather pass their lives with the inconvenience and risk which this state of things involves than submit to the knife. There can, however, be only one other possible means of treating phimosis, and that is by stretching the prepuce. But this method appears to be very seldom put into practice, for when it is tried it generally results in failure. I can see no reason, however, why the skin and mucous membrane surrounding the glans penis should not be as freely dilatable as in other parts of the body. The reason of the failure, I take it, is simply this —that no proper instrument has been invented for the purpose.

Extemporised instruments, such as dressing-forceps, blunted hooks, &c., are utterly useless for the purpose. Take dressing-forceps for instance. It is impossible to insert them into a very small prepuce. If the blades be inserted open, one may be passed through the prepuce and down between the glans and foreskin, but it is impossible to get the other blade in. If the forceps be

introduced with the blades closed, they immediately impinge upon the glans and will go no farther. Even if they could be successfully introduced through the prepuce, immediately they are opened the constriction will slip up to the narrowest part of the forceps, viz. to the joint, since the blades cannot be opened parallel to one another. The consequence is that the ends of the forceps press out the walls of the foreskin, but no extension is applied to the constriction itself. An instrument proper for the purpose must be free from all these objections. (1) It should be possible to introduce the blades separately. (2) They should





open parallel to one another or at any angle. (3) The blades must be of a suitable size and shape to suit the case.

The instrument which I have devised for this purpose consists of two rods, A B, connected together by means of two long screws, C D. At one extremity they are bent inwards and fixed to the blades E E. These blades can be removed, and may be of any size and shape. The rod B is of a tuning-fork shape, with the screw-nut M sliding in the groove between the two branches of the fork. Through the nut M is passed the long screw C, the end of which is received into a cup working on a hinge joint attached to the cylinder K. The screw-end may be detached from the socket by pressing a little spring. The cylinder K slides along the bar A.

The blades are passed separately down between the foreskin and glans. Very small ones are used at first. They are then attached to the rods, which are united by fixing the end of the screw-rod C into the cup-joint K. The screw-rod D, which is fixed only to the bar A by a joint, can be pulled over into the groove of B. Gradual extension can then be applied by turning the nuts M and N. Since there is a joint at K, the blades may be opened parallel to one another or at any angle, and in fact the relative position of the blades may be altered in any direction, so that the constriction may be attacked wherever situate, and any tendency for the constriction to slip up, as in the case of dressing-forceps, can be counteracted.

The idea is not to stretch the foreskin forcibly and at one sitting, but to gradually dilate it in the same manner as a stricture of the urethra is dilated by repeatedly passing a catheter. If the instrument be used once or twice a week for about ten minutes at a time, the foreskin will in most cases go back in a month or six weeks.

The larger blades may be used to thoroughly stretch the tissues and complete the treatment. The foreskin may thus be dilated to any reasonable extent, and will after a time easily roll back over the corona. The instruments are made by Messrs. Arnold and Sons of West Smithfield.

RESEARCHES RELATING TO THE PATHOLOGY AND TREATMENT OF CHOLERA.

BY T. LAUDER BRUNTON, M.D. F.R.S., AND P. H. PYE-SMITH, M.D.

Two great evils which affect mankind, are drunkenness and disease. Both of them are closely connected with microbes, and with the qualities by which these organisms are aided in the struggle for existence. The torula cerevisiæ, or yeast-plant, produces in the course of its growth a substance—alcohol—which if swallowed by man in large quantity causes symptoms of poisoning (*i.e.* intoxication); yet its effects are such, that men desire it, and for its sake the torula cerevisiæ is cultivated most extensively. The torula grows and multiplies, and, by means of this product alcohol, its success in the struggle for existence is ensured.

Other microbes produce poisons, which aid them in the struggle for existence in a different way.

Non-pathogenic bacteria introduced into the blood of a healthy animal have a battle to fight with the living cells of the organism, and in this struggle the organism has the best of it, and the bacteria rapidly disappear. Other bacteria produce poisons which weaken or destroy the living cells; the organism dies and the bacteria run riot in it.

The poisons produced by bacteria are ultimately fatal to themselves, so that they may be "hoist with their own petard;" but before this happens the organism with which they are in conflict succumbs and the bacteria gain an advantage.

In the case of the torula it is easy to see what a wide difference there is between the action of the microbe and that of its

products on the human organism, because they are not introduced into it together. It is evident, however, that if they were introduced together, the action on the organism would be much more complicated. For in addition to the action of the alcohol there would be the action of the carbonic acid generated in the stomach from the food, the disturbance of the normal processes of digestion, and probably the formation of injurious substances, such as we actually find in dilatation of the stomach where yeasty fermentation occurs, and may sometimes have an opportunity of seeing also in persons who have drunk beer while it was still fermenting. The probability is that while the alcohol contained in a glass of thoroughly fermented beer would perhaps slightly quicken the pulse and stimulate the circulation after it had entered the stomach and been absorbed into the blood, the torula itself would work such changes in the contents of the stomach that sickness, depression, and vomiting, would be the result, while the products of abnormal decomposition in the food might be absorbed and cause a splitting headache.

The torula itself would not enter the blood from the digestive canal. If it did, other effects still might be produced.

In the case of bacteria it is much more difficult to analyse the effects produced on the organism than in the case of torula. Not only are the microbes and their products introduced together into the organism so that there is the local action of each at the point of introduction, whether this be the digestive canal, the respiratory passages, or an open wound, there is also the action of their products when absorbed into the blood ; and to complicate matters still further the microbes themselves enter the circulation, and we have to consider the action which they then exert on the blood and tissues.

Even when we take the simpler case where the bacteria themselves probably do not enter the blood but merely are introduced into the intestinal canal, it is often hard to say how far the effects they produce are due to the microbes themselves and how far to their products.

Thus, if a person eats a piece of meat-pie and is seized shortly afterwards with violent sickness, vomiting, and symptoms of collapse, it would be hard to say how far these symptoms were

due to bacteria, which microscopic examination might show to be abundantly present in the pie. The symptoms might no doubt be due to the action exerted directly by the bacteria themselves upon the intestine or upon the nervous system after their absorption into the blood; but they might also be due to poisons formed in the pie by the action of the bacteria on the meat, in which case the symptoms of poisoning would have just the same relation to these bacteria that drunkenness has to the yeast-plant. The symptoms in both cases would thus be due, not to the direct action of the microbe itself, but only to that of its products upon the organism.

In order to discover how far the symptoms are due to the microbe bacteria, and how far to these products, we must follow the same plan as in the case of yeast—give the two separately. It is true, that if we put either yeast or bacteria into the stomach some of its products will probably be formed there, and thus we shall not get the action of the microbe pure and simple. Yet if we can obtain the product alone and ascertain its action apart from the microbe, we shall be able to make allowance for it in considering the effect produced in the organism by the microbe. Thus a little alcohol may be formed in the stomach by yeast, but as we know the action of alcohol when given apart from the yeast, we are able to make allowance for it, and estimate pretty precisely the effect of the yeast itself in the stomach notwithstanding the presence of some alcohol which it may have formed there.

In a similar manner we may distinguish between the action of the chemical poisons formed by bacteria and the action of the bacteria themselves.

Within the last year or two a great deal of attention has been bestowed on the poisons formed by microbes, and which are known under the name of ptomaïnes.

It is not quite certain whether these poisons are formed within the microbes, or whether they are produced by the decomposition of the substances in which the microbes are growing. These microbes are now generally classed as plants belonging to the algæ, and if we suppose that the poisons are formed within them the case would be analogous to what we find in larger plants low in the scale, such as muscarine, which is formed in the

tissues of a fungus. If we suppose, on the other hand, that the poisons are formed by the decomposition of the nutritive medium in which the microbes grow, the case would be analogous to the formation of alcohol by the yeast plant.

The first important work on this subject was by Bergmann and Schmiedeberg, who obtained an alkaloid, to which they gave the name of *sepsine*, from decomposing yeast. This alkaloid completely separated from all microbes, and, indeed, obtained in crystalline form, when injected into the circulation in dogs caused vomiting and purging, with bloody stools. Selim, Gauthier, and others have since discovered a number of alkaloids due to putrefaction and possessing various physiological actions.

It is evident that microbes may cause decomposition with formation of poisons in nitrogenous media in the intestinal canal as well as outside of it; and that the chemical poisons thus formed may, by their absorption into the blood, produce death. Dr. Klein, in his recent papers in the *Practitioner*, shows clearly that in many cases the death of an animal which is killed by microbes is not due directly to these organisms, but is due to the poison which they produce.

In considering the pathology and treatment of cholera we must therefore carefully distinguish between the direct agency of microbes in producing the disease and the effects which may be due to chemical poisons produced by them. If cholera be caused by microbes, we must seek to destroy them in order to prevent the spread of the disease. The cure of an individual patient is, however, a very different thing, for the symptoms from which he suffers and which are likely to bring about a fatal termination are in all probability not due to the microbes themselves but to the chemical poisoning which they have generated. If we could destroy the yeast plant completely we might entirely prevent the formation of alcohol, and thus put a stop to drunkenness, but measures calculated to destroy the plant would be of no use whatever for the purpose of restoring consciousness to a man who was dead drunk, or for treating a case of delirium tremens. Unfortunately we do not as yet know the proper means for treating a case of cholera. If this end had been arrived at, it would be quite unnecessary to discuss in detail steps of the investigation which had led to such a

desirable result. It would be quite sufficient to indicate them briefly, but it appears to us that when the object has not yet been attained, it may be desirable to give in some detail the steps of an investigation in which we were engaged for some years, so that others working on the same subject may not needlessly have to go over the same ground. The results of our experiments were published in the Reports of the British Association, and as we believe that these reports are not generally read by medical men, we have thought it advisable to republish them here.

We propose first to reprint them in the order just as they were originally published, so that the readers of the *Practitioner* may follow the investigation; and then we intend to consider the question of the pathology and treatment of cholera as it at present stands; and finally to point out in what directions we think that a search for remedies is most likely to be successful.

Physiological Researches on the Nature of Cholera. By T. LAUDER BRUNTON, M.D., Sc.D. *Read before the British Association at Bradford, Sept. 23rd,* 1873.

The medicines which have been employed at one time or another in the treatment of cholera are almost numberless, and yet the universal dread in which this terrible disease is held, no less than the distinct acknowledgment of the uselessness of treatment which we find in medical text-books, clearly shows that the search after a true remedy has hitherto been fruitless. Empiricism having entirely failed, it only remains to be seen whether a greater means of success is to be attained by patient scientific research. I now purpose to give the outlines of an investigation which I began two years ago, but which circumstances have hitherto prevented me from completing. I should not have brought it before the Association in its present imperfect state were it not that I find a remedy, which my experiments had indicated to me as one likely to be beneficial, has lately been tried empirically in America with good results,[1] and I hope that others may be induced not merely to give

[1] Saunders, American *Practitioner*, July 1873.

this remedy a fair trial, but to search for other medicines possessing properties which I am afraid this one lacks.

The cause of cholera is now generally admited to be a poison of some sort, which can be conveyed about from place to place and transmitted from one person to another, through the medium of the evacuations which either get into water and are drunk, or become dry and are taken into the mouth and nostrils in the shape of dust. Some, even yet, are inclined to hold that cholera results rather from peculiar atmospheric and other conditions than from the presence of a specific poison, but the fact that the disease may be conveyed from one infected locality to numerous others by a single individual, breaking out where he has stopped and passing over those places which he has only travelled through, although these may present apparently identical conditions of air, sea, and water, shows conclusively that an outbreak of the pestilence cannot be due to these latter circumstances alone. Nor will the mere presence of the poison always produce cholera, for those who are exposed to contagion do not all become affected, and even those who have swallowed cholera stools in which the poison is supposed to be present in its most concentrated form have sometimes escaped with impunity. It would appear that two conditions are required, viz., the presence of the poison and the existence of a proper soil for its development. In other words, it would seem that the poison does not produce its usual effects even when it has entered the system, unless the blood and tissues are in such a state that it can act upon them. The nature of this state we cannot exactly define, but its presence seems to be due in great measure to those conditions of atmosphere and soil which some assert to be the immediate cause of the disease, but which in reality only predispose to it.

Without entering into this question at any greater length I shall assume that cholera is caused by a specific poison acting upon an organism which has become in some way or other susceptible to its influence. The effects of the poison upon the body may be summed up in a few words. It produces irritability of the digestive canal, immoderate secretion from the intestines, and lessened circulation both through the lungs and the body. Bearing in mind these actions, it is perfectly easy for any one to

deduce from them all the symptoms which are observed in the state of cholera collapse.

From the irritability of the stomach and intestines there is constant vomiting and purging. The secretion from them is so profuse that the whole intestinal canal is speedily washed clean out; the stools are no longer feculent nor even tinged with bile, but consist of the secretion alone, pure and unmixed, and resembling rice-water in appearance. The blood is thus drained of its fluid parts, and the consequence of this is intense thirst which adds greatly to the sufferings of the patient. The blood itself, instead of coursing rapidly through the vessels as it does in health, stagnates in the great veins of the thorax and abdomen (see diagram), the left side of the heart instead of receiving from the lungs a full suppy of well-aërated blood, which it would propel through every part of the body, receives only a scanty driblet which leaves it almost collapsed; the arteries which proceed to the body are so empty that when they are cut across hardly a drop of blood flows from them, and even when a tube is passed through the carotid artery and aorta right up to the sigmoid valves of the heart, as was done by Dieffenbach,[1] no blood can be drawn from it. The warm blood from the interior of the body which usually circulates in the vessels near the surface, imparting to it the plumpness, warmth, and rosy hue of health, stagnates in the abdominal veins and leaves the skin shrunken, pale and cold, while that in the interior of the body being no longer cooled by circulating near the surface, becomes hotter and hotter, till the internal temperature of the unfortunate patient is higher than it usually is in high fever though his skin and breath are cold as ice.[2] The blood which fills the small cutaneous veins being no longer driven forward by fresh supplies from the arteries, becomes completely deoxidised and black, imparting to the surface a livid hue. So dark does the blood become that it assumes the colour of bilberry juice,[3] and the colouring matter leaves the corpuscles and tinges the serum.[4] It still retains its power to take up oxygen and give off carbonic

[1] Dieffenbach quoted by Magendie, *Gaz. Médicale*, 1832, p. 253.
[2] Güterbock, *Virch. Arch.* xxxviii. p. 30.
[3] Niemeyer, *Symptomatische Behandlung der Cholera*, p. 13.
[4] Parkes, *On Cholera*, p. 124.

acid,[1] but notwithstanding this it passes so slowly through the pulmonary vessels that only about one-third of the usual quantity of carbonic acid is given off from the lungs,[2] and little oxygen being taken in there is a distressing feeling of want of breath. The voice at the same time is hoarse, low, and weak, but this seems to be simply a consequence of the general exhaustion of the patient.

Such are the symptoms of cholera, all arising from disturbance of the circulation and excessive intestinal secretion. The remedy we seek must, therefore, be one which has the power of removing these conditions. It may be thought that the only way to do this is to eliminate from the body the poison which is producing these results, and that so long as it is still circulating in the blood any remedy which is simply intended to counteract its effects will be administered in vain. But the researches of Fraser[3] and others on antagonism have shown us that the elimination of a poison is not required in order to prevent its injurious or fatal action, for the administration of an antidote will deprive it of its hurtful power, and as it is with other poisons, so may it be with that of cholera.

While thinking over this subject two years ago it occurred to me that if any poison should possess actions similar to those of the cholera poison, an antidote to it might possibly prove to be a remedy for cholera. It was by no means certain that it would do so, but still this direction seemed to be the one in which the search after a cure for cholera might be prosecuted with the greatest chance of success. I therefore began to look for a drug which would produce the same changes in the circulation which I have described as occurring in cholera. These were, I believe, first ascribed by Dr. Parkes[4] to spasmodic contraction of the vessels in the lung, which prevented the blood from passing through them, and this opinion has found a warm supporter in Dr. George Johnson. It will be readily seen that almost all the symptoms can be explained on this supposition, though there are some, as I will afterwards show, which this hypothesis does not

[1] This is shown by its becoming red on exposure to air, Parkes, *op. cit.*, p. 113.

[2] Rayer, *Gaz. Méd.*, 1832, p. 278, and others quoted by him.

[3] Fraser, *Transactions of the Royal Society of Edinburgh*, vol. xxvi.

[4] Parkes, *On Cholera*, London, 1847, p. 105.

include. The obstruction to the passage of blood through the lungs causes breathlessness by keeping the blood from the air just as readily as it could be done by a plug in the windpipe keeping the air from the blood. The left side of the heart getting little or no blood becomes empty, the arteries do not bleed when cut,[1] the surface gets shrunken and pale, while the veins get distended, and the right side of the heart is found, *after death*, to be full of blood.[2]

If, then, Dr. Parkes's and Dr. Johnson's idea regarding the arrest of circulation were correct, the first thing to be found was some drug which would remove the contraction of the vessels in the lungs.

[1] Dieffenbach quoted by Griesinger, Virchow's *Handb. d. Pathol. u. Therap.*, Bd. II. Abt. 2, p. 327, and by Magendie, *Gaz. Méd.*, 1832, p. 253.

[2] Parkes, *op. cit.*

NOTE.—It will be observed that in this paper no clear distinction is drawn between the action of microbes and of the poison they produce. At p. 358 the word poison is used in reference to the microbes when speaking of their development, while at p. 359 the same word is used in reference to the elimination of a chemical substance.

(To be continued.)

Reviews.

The Refraction of the Eye, a Manual for Students. By GUSTAVUS HARTRIDGE, F.R.C.S., Assistant-Surgeon to the Royal Westminster Ophthalmic Hospital. London: J. and A. Churchill. 1884.

THIS is a most excellent book for students, and some additional chapters on the treatment and management of complications of mal-refraction would make it also a very valuable book for practitioners. The chief part of it is after the manner of Donders, who has not left much to be written on refraction; and a useful chapter on retinoscopy is added. As much optics as is necessary for the purpose is introduced; there is a plentiful supply of illustrations, and at the end a very useful set of test-types and Pray's test-letters for astigmatism.

The General Practitioner's Guide to Disease and Injuries of the Eye and Eyelids. By LOUIS H. TOSSWILL, B.A., M.B., Cantab., Surgeon to the West of England Eye Infirmary at Exeter. London: J. and A. Churchill. 1884.

THIS small book would have been more useful if the advice given were more definite and decided and without repetition. Thus on page 3: "In *many* cases it is advisable to ascertain the amount of vision possessed by each eye"; and on page 9, very properly: "It is a good plan *invariably* to test both eyes," &c. More care should have been taken to advise the avoidance of irritating remedies. We see so many cures wrought by leaving off all but the most simple treatment. Nothing is said about the local irritation sometimes produced by atropine, and especially likely to happen if it is applied as here suggested. To those about to apply a lotion of arnica tincture to a black eye, we should say "*don't*," for it sometimes produces a terrible eruption; yet here it is said to be "an excellent remedy." We have no experience of "black bryony and bread crumbs" in this accident, and should be inclined to use an ice-bag in the first place, and afterwards apply a weak solution of acetate of lead. In the treatment of phlyctenular ophthalmia, the importance of fresh air is not insisted upon; sufferers from this malady are always confined to the house by their anxious friends. Local cleansing with tepid water also, every two hours, is of great importance in most cases. Practical hints of this kind are of more value to the practitioner than such sentences as "Defective hygienic conditions must be at once remedied."

Syphilis and Pseudo-Syphilis. By ALFRED COOPER, F.R.C.S. London: J. and A. Churchill. 1884.

THIS treatise contains more than three hundred pages on the subject of syphilis, discussing the symptoms and treatment of the malady in all its manifestations. Mr. Cooper's account of the onset of syphilis is especially good, and he well illustrates the difficulty of diagnosing syphilitic fever, which has often been mistaken for malaria, measles, or rheumatism, until the more definite signs have appeared.

Mr. Cooper's opinions about treatment will be read with interest. Most practitioners will agree in the condemnation of the hypodermic injection of perchloride of mercury, and will be glad to find a verdict in favour of mercurial inunction. We are disappointed to find no hints regarding the preparation and purity of the drugs prescribed. Care is needed to obtain good calomel suitable for fumigation, and some cautious physicians have given up prescribing *pulvis hydrargyri cum cretâ* because it is so often mingled with irritating mercurial compounds. We regret to remark the total absence of illustrations; we feel the need of them at many points.

Shortening the Round Ligaments. By WM. ALEXANDER, M.D., Visiting Surgeon to the Liverpool Infirmary. London: J. and A. Churchill. 1884.

THIS is an account of the operation for the relief of prolapse and retroflexion of the uterus by cutting down upon the round ligaments in the exterior abdominal ring, shortening them, and fixing them in the wound with catgut sutures. Any operation which relieves the condition of so-called *prolapsus uteri* must deserve the attention of every thoughtful medical man. When the uterus comes down and appears at the vulva, the whole pelvic floor seems to give way, and bladder, and sometimes bowel also, will protrude. The patient's condition is, in such cases, most distressing. Does Dr. Alexander's operation do much for such cases? Looking at his results we are obliged to notice that previous operations for contracting the vagina, and subsequent operations for the cure of cystocele, are spoken of, whence it appears that the single operation he recommends is by no means sufficient. It is more useful, probably, in cases of retroflexion; but, as the author very truly remarks, the uterus may be placed in good position by the operation, yet the symptoms supposed to have been due to uterine displacement may continue. Indeed, his own words are probably of the widest application when he says, "Cystoceles are not curable to any extent by the operation. . . . The uterus is merely changed in position, and brought nearer the symphysis."

Clinic of the Month.

Jequirity in certain Skin Diseases.—Dr. Shoemaker, of Philadelphia, has used this substance in affections of the skin showing great cell proliferation; such as lupoid conditions, epithelioma, sloughing ulcers, &c. He writes: "When at first disappointed with the ordinary infusion used in eye affections, and also with the dry powder dusted over the surface, I applied to Dr. L. Wolff, the well-known chemist, for a more effective preparation, which would not alone be much stronger, but which would at the same time be more viscid, so as to adhere longer to the surface." This he accomplished in a most successful manner in the following way:—Two hundred grains of the abrus bean are decorticated by being slightly bruised and cracked in a mortar; the red hulls are carefully picked from the cotyledons and, in a bottle, covered with distilled water. They are thus macerated for twenty-four hours, when they are again transferred to a mortar and thoroughly triturated until they are reduced to a smooth paste, when sufficient water is added to make the whole weigh 800 grains. Prepared in this way, it presents all the appearances of an emulsion, and is applied with a large camel-hair pencil or mop to the surface to be treated. The effect of this preparation of jequirity while almost painless in its application to ulcerated and granular surfaces, soon developed (and often within an hour) a great deal of irritation and inflammation, rendering the edges red and infiltrated, the surroundings œdematous and shining, and caused some febrile exacerbation in the patient, depending in degree on the area involved. The usual concomitant symptoms of such febrile process are apt to show themselves at this stage, such as headache, pain in the extremities, elevated temperature, and high pulse, all of which, however, are not general, but found only occasionally, and particularly in irritable and very susceptible patients. In the course of from six to twelve hours, the products of this specific inflammation are abundant and soon aggregated on the surface in a desiccated, cuirass-like crust, which now obscures further observation. This crust, in the course of twenty-four hours,

further exhibits a tendency to crack and break, giving vent to the flow of the products of the degenerative process. This condition if left alone, will continue for five or six days, the discharge lessening by degrees; the firmly adhering crusts, if not detached on their own account, are now removed by water dressings, and expose to view a surface studded with healthy granulations and islets of healed-up surface, along with evidence of the progress of the regenerative process at the periphery. In cases where one application does not suffice, and where there is still evidence of the presence of unhealthy granulations, a second application is now made, and conducted as before, a third and further application being made as the case may require. The results thus obtained with jequirity will best be seen from the citation of a few cases from the Case-book of the Philadelphia Hospital for Skin Diseases. Case 1.—John T.——, aged thirty-five years, car conductor, has been under treatment for some time. Specific ulceration on the right leg. He cannot give up his occupation. Under specific treatment the colour of the edges improved, but showed no tendency to heal. By an application of jequirity the ulcer in one week was greatly improved, with edges smooth and healing; another application of jequirity healed up the ulcer completely after the second week. Case 2.—Jane W——, aged seventeen, factory hand. Scrofulous, indolent ulcer on neck, easily bleeding with unhealthy ground. She was put under constitutional anti-scrofulous treatment. After an application of jequirity the crusts were removed in a week, the patient being greatly improved in health. After two weeks' applications the ulceration was looking healthy, and healed under simple dressings. Case 3.—Mrs. G——, aged forty. Ulcerating lupus extending over the bridge of the nose. A case of Dr. Albert Fricke, of this city, to whom I was called in consultation. The patient had been under the care of several physicians. Escharotics and scrapers had both been applied, but to no advantage. I suggested the use of jequirity. The first application of a clear infusion proved of no avail, running off without causing any marked irritation. The concentrated emulsio-infusion was applied with a camel-hair brush every third day, until a firm cuirass-like scab was formed. After this had become spontaneously detached, at the end of three weeks, the surface entirely healed over. Case 4.—Mr. W——, aged forty-three. A large epithelial ulceration on the dorsal surface of the left hand. He met some years ago with an injury to the hand. He had gradually increasing lancinating and excruciating pains and spreading ulceration, until it entirely covered the dorsal surface. He had been under various treatment, with only partial amelioration of the symptoms. Had been cauterised and scraped with no permanent advantage. The concentrated emulsio-infusion of

jequirity was applied in the usual way. It soon developed all the signs of the specific inflammation, leaving immense scabs, which were four times detached, and followed by new applications, when ultimately the entire surface was completely cicatrised. Case 5.—Lavinia W——, aged forty-five, seamstress. Ulcerating lupus on both sides of the face. A most desperate case. She had been under treatment for years, consisting of periodical scrapings and applications of caustics as well as the cautery, which in every instance were followed by exuberant granulations notwithstanding the most careful local and constitutional treatment. The surface was affected in irregular patches, extending to no less than two and a half by four inches on each side. As a *dernier ressort,* and a last case for the jequirity treatment, the concentrated emulsio-infusion was applied freely over the patches. It was followed by an enormous amount of inflammation, accompanied by malaise, febrile exacerbation, the temperature rising to 103°, which lasted until the cuirass-like crusts had formed and commenced to dry up. After these were detached and the applications renewed, the same constitutional disturbances took place, lessening, however, in the proportion as cicatrisation diminished the affected surfaces. After the fifth application the crusts were allowed to detach themselves spontaneously, and with it a well-healed surface was apparent all over the patches, granulations, tubercles, and ulcerations having entirely disappeared. To sum up. The results of the treatment of diseases of the skin with jequirity lead me to pronounce it a most powerful agent, applicable to almost all cases of unhealthy ulcerating and granulating conditions, upon which it certainly exercises a destructive tendency, followed by a constructive change, and forming under the protective covers of the exudation it causes a rapid development of healthy tissue. Though under proper conditions and careful supervision it is a remedy of the greatest service, it should be applied with caution, as it may give rise to alarming symptoms, erysipelatous inflammation, and, if used on weak and irritable patients, to great constitutional disturbances. These symptoms, however, will speedily subside with proper attention, and on the drying of the crusts. That jequirity has a still larger field than simply that of ophthalmic practice will readily appear as a deduction from my experience. (*Lancet*, August 2, 1884.)

A Method of Totally Extirpating the Uterus.—Prof. Muller, of Berne, has modified the method for the total extirpation of the uterus in the following manner. During the operation the abdominal aorta is compressed, and the uterus turned out through an incision in the posterior wall of the vagina. After securing the broad ligaments and vaginal tissues

with provisional ligatures, the uterus is then divided vertically with knife and scissors into a right and a left half, each of which is drawn down and the ligaments secured just as in the treatment of pedicle of uterine polypi, the uterine tissues divided about one centimetre from the ligature. The wound in Douglas's pouch is not closed, nor is drainage employed, the only dressings being dry carbolised gauze, and daily washing with corrosive sublimate. In the four cases in which the author employed this procedure the result was perfectly satisfactory, probably from the very slight loss of blood which this method entails. (*Deutsche med. Zeitung*, May 12, 1884.)

Partial Laryngectomy.—At the recent meeting of the German Surgical Association, Hahn, of Berlin, recorded five cases of laryngectomy for carcinoma, the entire larynx having been removed in three, and one-half of that organ in two. Of the former, two died of suppurative bronchitis and pneumonia in the fourth and fifth week, and the third was still living at the end of three months. Both of the latter recovered and were free from recurrence, respectively, at the end of three years and a half, and nine months. They were wearing a simple cannula, and were comfortable, and made themselves so readily understood that they refused to have the wound closed. Hahn is a strenuous advocate of removing only one-half of the larynx where the limited extent of the disease admits of it. Total extirpation has resulted in twenty-four deaths out of fifty-two cases, while removal of one-half of the larynx has terminated fatally once out of eleven cases. Not only is the latter operation more safe, but it is less frequently followed by recurrence, and the functional results are so much better that the cannula can be dispensed with in the majority of instances. In the discussion elicited by the reading of the paper, Hahn found two warm supporters of his views in Schede, of Hamburg, and Küster, of Berlin. Schede's patient was living eighteen months after excision of the right half of the larynx for carcinoma. He had ceased to wear the cannula for nine months, and his articulation was distinct. Küster's operation was for sarcoma, but the speech was hoarse and less clear than in Schede's case. Unfortunately, the time that had elapsed since the operation is not stated. (*Philad. Med. News*, July 12, 1884.)

Treatment of Buboes by Aspiration.—In a note to the *Indian Medical Gazette* for June, Mr. Weston, of the Meerut Hospital, states that he has seen two cases of bubo successfully treated by the late Surgeon-Major Hogg, by means of the pneumatic aspirator. "The men," he says, "went out of the hospital much sooner than they would have done had the buboes been laid open. In one case the operation had to be

repeated once. A pad and bandage were used after the pus had been drawn off. In our military hospitals, where the ordinary plan of laying open the bubo is practised, one often sees the resulting sore take an unhealthy action, and, as a consequence, the men are kept in hospital for several months. It would be well, therefore, to give the aspiration treatment a thorough trial." (*Med. Times*, July 19, 1884).

Ergot in the Treatment of Constipation.—Dr. Granzio reports two cases of constipation, following the abuse of purgatives, relieved by ergot. Three doses of ten grains each were given at intervals of two hours, and were followed by a copious evacuation. A second stool occurred spontaneously the next day, and after the administration of ergot in smaller doses for a few days a definite cure was obtained. The constipation was due to atony of the muscular wall of the intestines. (*Allgemeine medicinische Central-Zeitung*, May 24, 1884.)

Fifty Cases of Tænia.—Dr. Krabbe has published a report of two hundred cases of tænia met with in Denmark. Dr. Friis, of Tönder, now reports fifty cases coming under his personal observation. Of these, forty-two of the parasites were of the species *Tænia mediocanellata*, six were *T. solium*, and two (in children one year old) were *T. cucumerina*. The *T. mediocanellata* was found in thirty-two females and ten males. Doubtless a similar proportion would be found in the cases of *Tænia solium* if a sufficient number of cases could be collected. It would seem that women are ordinarily infected by tasting the raw meat for puddings, &c. Friis found, as did Krabbe, that the majority of infected persons are between the ages of twenty and forty years. None of the remedies used was completely inefficacious, and in the case of the *Tænia solium* almost any of the usual remedies are likely to succeed except the officinal preparation of the extract of male fern, which seems to be very inefficient. In the cases of *T. mediocanellata*, however, *Filix mas* was the most efficient of all remedies. The second place must be given to pomegranate root, with or without kousso; but this ordinarily requires several trials, which is not the case with *Filix mas*. Under the use of the rectified ethereal extract of male fern, in cases of *T. mediocanellata*, the head came away in 10 cases; the worm disappeared in 6; result unknown in 2; no failures. With the ethereal extract of male fern there were 6 failures. With pomegranate root, the head came away 4 times; the worm 4 times; result unknown 1; failures 5. With pomegranate root and kousso, the head came away 3; the worm 2; result unknown 2; failures 2. With kousso, the head came away 1; failure 1. With psaoria, result unknown 1;

failures 2. With kamala, failure 1. (*Nordiskt Mediciniskt Arkiv.*, Bd. xvi. Hft. 1-6, 1884; *Phil. Med. News.*)

Differential Diagnosis of Simple and Tuberculous Meningitis.—In an analysis of a number of cases of meningitis occurring in the Children's Hospital at Stockholm, Dr. O. Medin endeavours to formulate the points of difference in the tuberculous and simple forms of the disease. Tuberculous meningitis attacks only those children already suffering from tuberculosis of other parts, while simple acute meningitis occurs usually in previously healthy individuals. The former manifests its onset by convulsions, frequently strabismus, and dilatation or contraction of the pupils. Vomiting is frequent at the commencement, diarrhœa is the usual condition, and constipation is rare. The abdomen is never flat. The simple form begins with somnolence, twitchings, sudden changes of colour in the face, and hyperæthesia. More frequently than in the tuberculous form we meet with the hydrocephalic cry and and paralysis limited to the arms or to the face. The tuberculous variety is always fatal in its termination. (*Revue Médicale*, May 24, 1884.)

The Death-rate of Phthisis.—In a work recently published by Dr. Würzburg on *The Influence of Age and Sex on the Mortality due to Tuberculous Phthisis*, some of the generally accepted notions on this subject are overthrown. The opinion seems to have been commonly entertained that the greatest number of deaths from consumption occurred at about the twentieth year. But the statistics collected by Dr. Würzburg prove that, after a large percentage in infancy, the minimum death-rate is met with from three to fifteen years, and that then the rise is a gradual and steady one up to the period between sixty and seventy years. After that age a rapid decline is noted. These statistics are for Prussia, and embrace a period of five years, from 1875 to 1879. The same condition has been noted in Sweden and the United States, with this difference, that in these countries there is no decline after the age of seventy years. In England, however, the highest death-rate falls between twenty and thirty years, and the lowest between fifty and seventy years. There is but a very slight difference in the percentage of deaths from tuberculous phthisis between the city and the country. (*Medical and Surgical Reporter*, June 14, 1884.)

Sunstroke with High Bodily Temperature.—Surgeon Major O'Dwyer, of the Cairo Citadel Station Hospital, reports the following cases:—

CASE 1.—Private W. T—— (Highlanders) walked to hospital

on July 29th; he complained of dizziness in his head. His skin felt very hot; the pulse was quick and weak. He was stripped to the waist, and buckets of cold water were dashed over his head and back. He said he felt much better, and laughed at the idea of being carried up stairs on a stretcher. Before he arrived at the ward, however, he became insensible. His breathing was oppressed; carotids throbbed visibly; pulse weak and quick; pupils contracted; temperature, carefully taken in axilla, 110° F. He was at once stripped and placed in a bath, to which large pieces of ice had been added. An ice-bag was placed on his head and a large piece of ice was held to his neck and back of the head. A lump of ice was placed in his mouth to melt. After being ten minutes in the bath he became conscious and looked about him, but his pulse was very weak and flickering. A draught of aromatic spirits of ammonia was now administered. He was removed from the bath, when his temperature was found to be 105°. He became unconscious, and the temperature began to rise. He was again put into the cold bath, and in ten minutes the temperature of the body fell to 99·5°, and he became conscious. He was removed from the bath and an enema of sulphate of magnesia (B.P.) was administered cold. The temperature did not again rise and he made a rapid recovery, but remained weak and suffered from headache for some days.

Case 2.—Private B—— (Highlanders) was brought to hospital on July 28th, 1883, in a state of insensibility. Pupils contracted; breathing oppressed; pulse feeble and rapid; temperature 109° in axilla. He was treated as in Case 1, but his pulse became so feeble after removal from the bath that fifteen minims of sulphuric ether were administered hypodermically, and he revived at once. Temperature fell after the bath to 100·6°, and did not rise afterwards. He made a quick recovery.

Case 3.—Private —— (Highlanders), employed in the regimental transport, and much exposed to the sun, was brought to hospital on July 28th, insensible. Temperature in axilla 108°; pupils contracted; heart's action weak. This patient was treated as Cases 1 and 2. Temperature reduced to 101° by the cold bath, after which his pulse was so weak that he required half an ounce of brandy and two drachms of aromatic spirit of ammonia, repeated at short intervals for three doses. He made a good recovery. These cases are typical of some that took place about the same time, and are remarkable for the high bodily temperature, the feeble condition of the heart from the same cause, and the satisfactory termination in every instance, as we were able to deal with them at once. All took place at a time when the sun's rays were very powerful, and when cholera prevailed at Cairo. (*Lancet*, July 26, 1884.)

Resection of Muscles in Infantile Paralysis.—Mr. Keetley has recently undertaken the resection of part of the quadriceps extensor femoris in a case of infantile paralysis causing inability to extend the right knee. By shortening the weak, relaxed, and partly atrophied muscle, the operator hoped to increase its strength, with the aid of electricity during recovery from the operation. Mr. Willett has already resected the tendo Achillis in paralytic talipes calcaneus, with good results, finding that the shortening of the abnormally elongated tendon enables the muscles of the calf to regain some portion of their lost functions, especially when the muscular wasting has been chiefly due to disease, and has not advanced too far. Mr. Keetley's patient was a boy aged six, who had suffered from paralysis of the right lower extremity for four years, and the muscular atrophy was not complete, yet sufficient to prevent thorough extension of the knee. A longitudinal incision was made in front of the thigh, about three inches in length, ending an inch above the patella; the skin was held apart by retractors, and one inch of the entire substance of the quadriceps was cut away with scissors, about two inches above the patella. The separated ends were united by means of about one dozen carbolised catgut-ligatures. Esmarch's bandage had been applied before operation, and only one small artery required ligature. The wound was dressed with a small iodoform-pad and carbolic gauze, and the limb placed on a back-splint at an angle of sixty degrees with the bed. The wound healed rapidly and perfectly, but as the operation was performed on May 5th, it is as yet too soon to determine the results as regards the function of the limb. (*British Medical Journal*, May 31, 1884.)

Extracts from British and Foreign Journals.

Pædiatric Aphorisms.—The following aphorisms of Professor Letamendi are quoted in *El Dictamen* of May 10, 1884: (1) Children are like the mob; they always complain with reason, although they cannot give the reason why they complain. (2) Always look at the lips of a pale and sickly child; if they are of a deep red colour, beware of prescribing tonics internally. At the outset you will congratulate yourself, but in the long run you will repent of having employed them. (3) As a general rule, a sad child has an encephalic lesion; a furious child, an abdominal one; a soporific child has both, though indistinctly defined. (4) An attendance on children produces in the mind of an observant physician the conviction that the half, at least, of adult transgressors are so through morbid abdominal influences. (5) A sunny living-room, a clean skin, and an ounce of castor oil in the cupboard, these are the three great points of infantile hygiene. (6) To dispute the clinical value of tracheotomy in croup is to occupy time to no good purpose. Croup or no croup, if there be a positive obstruction to respiration in the larynx, it is but according to reason to open a way for sublaryngeal respiration. In the days of more knowledge and less nonsense, tracheotomy will be ranked among the minor surgical operations. (7) Dentition is a true multiple pregnancy in which the uterus and its fœtuses become petrified in proportion as they grow. It is not the direct or eruptive pressure, but the lateral pressure of all together, that is the most dangerous. It is from this that so many cerebral symptoms appear which can in no way be relieved by incisions of the gums. The only recourse against the dangers of this transverse pressure is to give the child more nourishment, in the hope that as the general condition is bettered the local condition will also be improved. (8) If the incisors of the first dentition are serrated it is bad, but if those of the second formation are the same, it is worse. It foretells a number of lesions arising from deficiency of mineral salts in the tissues. There is one only exception, and it is an important one. When

the serrated incisors are seen in strong children in whom the fontanelles have closed early, it is a sign of a robust constitution. Instead of a number of small and sharp dentations there are a few large blunt ones. (9) To regard the eruption of the teeth as the sole factor in the general process known as the first dentition, is to perpetrate a sort of medical synecdoche. Children get their first teeth because they are at the same time getting a second stomach and second intestines. (10) The body of a child possesses such a degree of "acoustic transparency" that in cases of necessity or convenience auscultation may be practised with the hand, converting it into a telephone which will reveal as much to the physician as even his ear could do. (11) In practice it is well to distinguish with precision a case in which disease is due to lumbricoids from one in which lumbricoids are due to disease. For in the former case anthelmintics are of service, but in the latter they do harm. (12) Since, until a child is able to talk clearly, his relations with the physician are purely objective, it is very necessary that we should study as carefully as do the veterinarians the exact correspondence between the lesions and the expression of the patient. (13) If you wish to cure rapidly and well joint-diseases in infants, you must treat them as you would a conflagration—douches, douches, and more douches, until you have succeeded in extinguishing them. (14) The entire system of the moral relations between children and adults should be changed. To speak to them incorrectly merely because they cannot pronounce well; to excite their fears and arouse their weird imaginations simply because they are easily frightened and impressionable; to stimulate their vanity because they are naturally inclined to be vain; these and other similar actions are not only wrong, but absurd. (15) There is finally a danger to the woman of contracting a vice as yet unregistered—mastomania, or the sensuality of nursing. When this physiological act degenerates into a vice, nursing becomes so frequent as to be nearly continuous, and the result is ruin to both mother and child. Finally, the physician must here, as always, be at once wise, discreet, of good judgement, and firm. (*N. Y. Med. Record*, June 28, 1884.)

Antiseptic Incision in Hydrocele.—M. Juillard tries to demonstrate the superiority of an antiseptic incision, such as proposed by Volkmann, to injection of iodine. According to M. Juillard, the iodine injection, like all other methods of irritating the tunica vaginalis, is a simpler operation, but is followed by violent reaction. The cure is very slow, and there is generally a return of the disease. On the contrary, an incision carefully made, with every antiseptic precaution, never

provokes inflammation due to reaction; it is not more painful than an injection, and cures as quickly, without relapse. The principal objection to this mode of treating hydrocele, is that it is long and requires great care and dexterity. M. Juillard's preference for treatment by incision is supported by fifty-four operations; he modified, in some respects, the primary method of Volkmann. He maintains that anæsthesia is not necessary; there is pain only when the skin is incised, and that is done rapidly. Large incisions are preferable to small. An interesting detail in the operation, according to M. Juillard's modifications, is the resection of a certain portion of the tunica vaginalis, in such a way that suture of the edges of this membrane does not prevent the principal fold from being applied immediately against the testicular fold. M. Juillard considers this particular most important, the essential condition to attain obliteration of the tunica vaginalis by union of the serous walls, which prevents the return of the hydrocele. This suture, made with very fine catgut, is covered by the walls of the scrotum, also sutured. Volkmann places a drainage-tube in the tunica vaginalis; M. Juillard in the scrotal wall, and only for a short time. An antiseptic dressing is then applied. M. Juillard lays great stress on the application of sponges to the scrotum; they act as absorbent compresses. (*Revue de Chirurgie*, Feb. 10, 1884; *Med. Record.*)

Mild Forms of Typhoid Fever.—Dr. Lupponi has given a very interesting and well-written clinical study of the slighter forms of typhoid fever, which the author classifies thus:—forms slight by their duration, forms slight by their intensity, and a third class slight by duration and intensity. Of forms slight as to their duration, constant symptoms are: splenic tumefaction, bronchial catarrh, and fever. The course of this last characterises the different varieties; the temperature either, as in ordinary attacks of typhoid fever, has three well-marked stages (period of ascending oscillations, stationary period, and period of decline), or is limited to one or two of these stages only. In some rare cases, the fever assumes the course of a quotidian intermittent without repeated rigors or sweats. Of the forms slight by intensity, the duration may be long. These either approach the classical type, or are irregular when the fever is "subcontinuous" or intermittent, or is partly continued, partly intermittent. Splenic tumour is a constant symptom. These slight forms must be considered due either to a small dose of the poison or to its exhausted activity, or possibly to the mode by which it gained access to the organism, as well as to the conditions of receptivity or organic resistance of the patient. The anatomical alterations are identical with

those of ordinary typhoid fever. There is no constant relation between their extension and the intensity or gravity of the clinical form. The diagnosis is very important, especially as regards prophylaxis; it is often very difficult. The splenic tumour, rash, pain in the ileo-cæcal fossa, evening headache, apathy of the patient, bronchial catarrh, often good appetite, notwithstanding the fever, pulse small, and very often dicrotic, are the chief elements of a good diagnosis. The prognosis in children is good; in adults it is subordinated to the docility of the patients and to the possibility of complication; in old people, it is always more doubtful. As to treatment, the author recommends calomel for the first three or four days, then mineral acids or benzoic acid. Except the general or partial cold bath, anti-pyretics, especially in cases of long duration, are harmful or useless. (*Archivio med. italiano*, April and May, 1884.)

Modification of Leiter's Tubes.—Dr. Mader, of Vienna, recommends a modification of Leiter's metallic tubes for conveying water over the skin for cooling purposes, the chief change being the substitution of india-rubber tubing. This can be stitched on a piece of calico or flannel of the size and shape required, care being taken to avoid sharp turns, which would diminish and even obstruct the calibre of the tube. The advantages of this form of the apparatus are the ease and cheapness with which it can be prepared, its durability, and the ease with which a bend in the tube can be rectified, such an occurrence in a metallic tube rendering the whole apparatus useless. It is also much more pleasant in application than a metal tube, being lighter and smoother, so that it is suitable for many cases, such as peritonitis, where a metallic tube could not be thought of. Its chief disadvantage is the lower conducting power of the india-rubber, preventing the water from being felt so cold as in the metallic tube; but as the part of the body wearing the apparatus has been found to have a temperature from 17° to 20° R. (38° to 45° F.) lower than the rest, this apparent disadvantage is not real. For hospital use, Dr. Mader suggests that the afferent tube should be attached to the water-pipe supplying the ward (a small cistern being interposed to prevent bursting from sudden increase of pressure), and the efferent tube led to the waste-pipe, so that the time, trouble, and disturbance necessary for the frequent emptying and filling of vessels may be avoided. (*Wiener med. Blätter*, Feb. 21, 1884.)

Iridin in the Sickness of Early Pregnancy.—In the *Edinburgh Clin. and Path. Jour.*, Feb. 16, Dr. Berry Hart recommends the use of two grains of iridin in the form of a pill to be taken at night, and to be followed in the morning by a

draught of Friedrichshall water, a teaspoonful of Carlsbad salts, or a doubly strong Seidlitz powder. He was led to the use of this remedy by Dr. Matthews Duncan's allusion to the probable influence of the liver in causing the vomiting of pregnancy. (*London Med. Record*, July 1884.)

Disinfection of the Sputum in Phthisis.—According to Koch, the dried sputum of tuberculous patients imparted tuberculosis to guinea-pigs after preservation up to three months. After five months the inoculation sometimes failed, and after eight months there were no results. Schill and Fischer made experiments on the disinfection of fluid sputum from phthisical patients, using the inoculation into guinea-pigs as a means of control over their results, which were as follows. (1) Decomposition for many weeks did not deprive the sputum of its specific virulent properties. (2) Steam passed over dried sputum sterilised it in from half an hour to an hour. For fluid sputum fifteen minutes sufficed, and hence the application of steam may be recommended. (3) Perchloride of mercury solution (1 to 1,000, or even 1 to 500) failed altogether. (4) Absolute alcohol (5 parts to 1 of sputum) was not absolutely certain in its sterilising effects. (5) Carbolic acid (5 parts of a $2\frac{1}{2}$ per cent. solution to 1 part of sputum) was without effect, but was efficient in a 5 per cent. solution. (6) Saturated aniline water required to be added in tenfold quantity to sterilise the sputum. (*Centrabl. für klin. Med.*, 24, 1884.)

The Ætiology of Eczema in Early Childhood.—Eczema in early childhood has hitherto generally been considered to be a manifestation of scrofula, as in many cases it undoubtedly is. Dr. Bohn, however, asserts that neither scrofula nor rickets can be considered to be the cause of the numerous cases of eczema of the head and face that occur in children during their first few years of life, especially as the great majority of these cases occur in infants not six months old. Most of these children are particularly well nourished, and appear to be otherwise in perfect health. Dr. Bohn asserts that the only general statements he can make about them are, that they are usually constipated, passing hard yellow or white stools, and that they are all too fat and have fatty livers. The treatment he recommends is based on these observations; the first step is to cure the constipation, the second to regulate the diet so that an excess of fat or fat-forming food shall be avoided, *i.e.*, the substitution of animal broths for some of the milk. The eczema should be treated locally in the usual manner. (*Jahrbuch für Kinderheilkunde*, 1, vol. xx.; *Med. Times*.)

Rest and Massage in Chorea.—Dr. John Van Bibber advocates strongly the employment of rest and periodic massage as an adjunct to drugs in the treatment of chorea. He states that "patients that have resisted all forms of treatment finally succumbed (*sic*) to power of rest and massage." Dr. Van Bibber ridicules the use of calisthenics in dealing with St. Vitus's dance. This mode of treatment by massage, which has also been beneficially employed in this country, deserves further notice and should be fairly tested. (*American Journal of Neurology and Psychiatry*, May 1884.)

Abortive Treatment of Soft Sores.—Professor H. von Hebra advises as follows. After thoroughly cleaning the sore, it should be treated with a preparation of spirit and potash-soap, carefully dried, and pure salicylic acid applied to the sore, which must be covered up with plaster. The treatment succeeds best when this application is renewed for two days running, and the sore suppurates freely. After three days the sore is covered with a white scab. The salicylic acid should now be abandoned, and an emollient ointment spread on lint employed in its stead. The scab speedily separates, and the wound readily heals without any likelihood of a bubo forming. (*Wiener med. Presse*, 14, 1884.)

Treatment of Cancer of the Rectum.—In a clinical lecture at the Necker Hospital, Professor Trélat drew the following conclusions with regard to the treatment of cancer of the rectum:—(1) Cancers of the rectum should not be touched, unless they cause grave disorders. This rule should be positive, with the single exception that very small cancerous deposits may be removed from the lower part of the rectum and the margin of the anus. (2) In all other cases the treatment should be confined to complications and palliative operations. In giving these rules I am in accord with Prof. Verneuil. (3) As palliative operations, rectotomy may be done when the finger can be passed beyond the upper limit of the neoplasm. If the neoplasm is more extensive, the surgeon should abandon rectotomy, and work out a way of derivation; for by performing rectotomy in these cases, the surgeon is almost certain to injure the peritoneum. With the English surgeons, and Labbé and Tillaux, I am in favour of lumbar colotomy, because it is a simple operation, less dangerous, and affords a ready means of exit for the fæces. Other surgeons prefer to make an inguinal anus; but there is risk of opening the small intestine, with all the attendant dangers and inconveniences. (*Revue de Thérap.*, May 15, 1884.)

Draught of Amyl Nitrite.—Dr. Richardson gives a formula for the administration of amyl nitrite by the mouth:—Amyl nitrite, pure, ♏xxxv; ethylic alcohol (sp. gr. 830), ʒv; pure glycerine to ℥iss. To make a mixture of twelve doses. One fluid drachm to be taken in a wineglassful of warm water. In asthma this method is specially recommended. (*Asclepiad*, July 1884.)

The Diagnosis of Sciatica.—A diagnostic point in sciatica is given by De Beurmann which we have never seen alluded to. The patient lying on his back with the muscles of the leg and back relaxed, the affected leg is raised while in complete extension and flexed upon the abdomen. This causes marked pain in the course of the sciatic, especially intense at the sciatic notch, and the movement is resisted. If, then, the limb be lowered, and while the leg is flexed on the thigh, the latter is again carried up on to the pelvis, no pain will be felt. This phenomenon depends on the fact, verified by De Beurmann in experiments on the cadaver, that great tension on the sciatic is exerted by flexion of the thigh when the leg is extended, but almost none when the leg is flexed. In the diagnosis of sciatica from crural neuralgia, affection of the femur, or coxalgia, in all of which diseases the position of the limb and seat of the pain may be similar, this manœuvre is of value. If the nerve trunk is free of disease there will be no difference in the amount of pain caused by the extension or relaxation of the nerve by the different positions indicated. In other words, in affections other than sciatica, the movements given to the coxo-femoral articulation will be equally painful whether the leg is extended or flexed on the thigh. (*Arch. de Physiologie*, and *Revue Médicale*, April 1884.)

Treatment of Nasal Polypus.—Dr. Richardson recommends the use of sodium ethylate in the treatment of nasal polypus. The caustic agent is applied by means of a probe made of soft cotton-wool twisted into shape on the points of a pair of forceps. This cotton probe is saturated with the ethylate and then plunged into the substance of the polypus. On removing the cotton it commonly happens that the patient can expel the whole mass of destroyed polypus, in a semi-fluid form, by blowing the nose sharply. A second application ought to be made with a view of destroying the base of the polypus. The mode of action is said to be sufficiently clear. The ethylate is decomposed by contact with the water of the polypus into caustic soda and alcohol; the latter coagulates the albuminoids and the former acts as a powerful caustic. With the exception of some burning pain no unpleasant effects seem to follow the use of this method. (*Asclepiad*, July 1884.)

New Operation for Disarticulation of the Calcaneum.—Dr. Marcacci, in view of the difficulty of disarticulating the os calcis by Clifford's or Ollier's method, proposes the following: A vertical median incision is made at the lower portion of the tendo Achillis, so as to expose the posterior superior surface of the bone, is carried below the insertion of the tendon, and along the plantar aspect of the foot, and almost to the apophysis of the fifth metatarsal bone. The incision must be deep and down to the bone. From the anterior extremity of this incision, and at a right angle to it, a second incision is carried perpendicular to the junction of the external and middle third of the dorsum of the foot. This incision cuts the tendons of the lateral peronei, and is prolonged so as to include the tendons of the extensor communis. A third incision is now carried obliquely toward the tibio-tarsal articulation, along the external border of the neck of the astragalus. The surgeon then commences his dissection at the anterior incision, and carries it backwards, completing the operation by dividing the calcaneo-cuboidal ligaments, and such plantar, dorsal, and interosseal ligaments as may be in the way. The calcaneum may then be removed with a pair of strong forceps. (*O Correio Medico de Lisboa*, February 15, 1884; *Amer. Journ. Med. Sciences.*)

Pathology of Paget's Disease of the Nipple.—Drs. Louis A. Duhring and Henry Wile, of the University of Pennsylvania, give an instructive study of the pathology of Paget's disease, which has already evoked some discussion. The importance of the subject is apparent, and it ultimately resolves itself into the question of distinguishing between ordinary eczema of the nipple and another similar cutaneous pathological process which on good grounds is believed to lead to the formation of malignant disease of the mammary gland. The affection is regarded by Drs. Duhring and Wile as an abnormal proliferation and degeneration of the rete, with secondary destruction of the papillæ of the corium, and subsequent development of scirrhus cancer of the atrophying variety. The cancerous change originates in the epithelium of the smaller ducts, and advances from below upwards and outwards as far as the skin is concerned; later it attacks the gland structure; and the retraction of the nipple is an early sign of carcinomatous change. (*Amer. Jour. Med. Sciences,* July 1884.)

Influence of Age on Primiparous Labours.—Kleinwächter has studied this subject very thoroughly, not solely with reference to the length of labour, but with a view to determining the relative liability of primiparæ of various ages to antecedent menstrual disturbances, to the various accidental complications of pregnancy and to puerperal disease. He has also investigated

the relative necessity of instrumental interference, relative morbidity, and mortality, the liability to abortion, and the influence of the mother's age on the sex and weight of children. The material for study Kleinwächter found in the records of 920 cases of primiparæ in his clinic at Innsbruck. These cases he divided into three groups, namely,—(I.) 16 to 19 years of age: 111 cases. (II.) 20 to 29 years of age: 694 cases. (III.) 30 to 41 years of age: 115 cases. These groups he designated as the young, the middle-aged, and the old, respectively. From his study of these cases Kleinwächter draws, among others, the following conclusions: (1.) Accidental complications, which have nothing to do with pregnancy, occur least often in the youngest primiparæ and most frequently in the old. (2.) Ailments attributable to pregnancy are observed most frequently in the old and next most frequently in the young. (3.) Hæmorrhages in the course of pregnancy occur most frequently in the young and least frequently in the old. (4.) The duration of labour is most frequently abnormally protracted in the old: in this respect the young stand next to the old. (5.) Inefficient pains, on account of which the duration of labour is abnormally protracted, are least often observed in primiparæ in the bloom of their sexual life, *i.e.* from 20 to 29, and most frequently in the old. (6.) Therefore, forceps must be used most frequently in the old and least often in the middle-aged. (7.) The lengthening of the labour of primiparæ with the increase of age occurs chiefly in the first stage: the second stage is scarcely affected by differences of age: the third stage is not at all affected. (8.) The mortality per cent. after forceps operations on primiparæ rises parallel with the increase in age. (9.) The older the primipara, the greater is the danger of perinæal laceration. (10.) The older the primipara, the more likely a post-partum hæmorrhage, although the frequency of hæmorrhage is by no means so great as hitherto supposed. (11.) With increase of age increases the disposition of primiparæ to affections of the kidneys. (12.) The frequency of œdema without kidney disease also increases with the age. (13.) The older the primipara, the less the danger of mastitis, and the less also the likelihood of her ability to suckle. (14.) The old most frequently, the middle-aged least frequently, sicken and die of puerperal fever: the same is true of puerperal mania. (15.) The morbidity and mortality per cent. is highest in the old and lowest in those from 20 to 29 years of age. (16.) Spontaneous premature labour occurs very frequently in old primiparæ, and least often in the middle-aged. (17.) With increase of age the frequency of abnormal positions of the fœtus increases. (18.) The older the primipara is, the more likely is she to bear a boy, except only those from 20 to 21 years of age, who bear more girls than boys.

(19.) Analogous to the discovery made by Hecker and confirmed by Wernich, that first-born children are heavier and longer the older the mothers are, is the fact that the umbilical cord of the first-born of old mothers falls off the earliest, and that of the first-born of the youngest mothers the latest. (20.) The liability to twin pregnancy in primiparæ increases with their age. (21.) With increase of age in primiparæ the frequency of bearing deformed children diminishes. (22.) The mortality per cent. of first-born children increases with the mothers' age: among the oldest primiparæ the fœtal mortality reaches a not inconsiderable height. (*Zeit. f. Geburt. u. Gynäk.* 1, x.)

On Opening and Drainage of Abscess Cavities in the Brain.—The antiseptic method of operating and after-treatment has not as yet been fully tested in operations upon the brain. This is natural, for not only have we inherited a just dread of dealing with an organ, the large majority of whose diseases are dangerous or fatal, but our knowledge of the physiological functions of the brain and of their pathological modifications being extremely limited, we are not in a position to form such an accurate diagnosis as calls for surgical interference. Drs. Christian Fenger and E. W. Lee, of Chicago, consider the treatment of traumatic cerebral abscess, and report a case which was successfully treated by opening and drainage. Bergman, in discussing the treatment of cerebral abscess, unhesitatingly sets it down as an axiom that wherever there is an accumulation of pus, trephining is most clearly and indubitably indicated, for the opening of an abscess in the brain is as necessary as in any other part of the body, and we would add even more so. A correct diagnosis of abscess having been made, the further difficulty presents itself of locating it with sufficient accuracy, so as to be able to find it. A number of cases are on record, in which a correct diagnosis had been made, the trephine also put on more or less at the right place, but the knife or trocar being passed into the brain, nevertheless missed the abscess. Drs. Fenger and Lee show by their case that this difficulty can be obviated by multiple exploratory aspirations, performed at interstices sufficiently small to prevent any abscess from escaping detection, even if the trephine opening should not have been made at the point of the skull nearest the abscess. There are on record a large number of cases of cerebral abscess, in which trephining was performed, pus evacuated, and temporary relief obtained; but later relapse followed, and a fatal termination ensued. It is possible, judging from the success the practice has met with in the treatment of abscesses in other situations, that drainage of the cerebral abscess-cavity, with or without washing out, would have saved some of these cases, by preventing the

reaccumulation of pus and the continuous infection of the surrounding brain tissue, the acute œdema of which is well known to be, as a rule, the final cause of death. As far as Drs. Fenger and Lee are aware, draining and washing out of cerebral abscess-cavities has heretofore not been tried; that it can be effected and without any detriment to the patient, is shown by their case, the treatment of which they hold strictly conforms to the rational methods of modern surgery in treating abscesses in general; and because of this, and not because their patient recovered, they regard the case as answering affirmatively the question: is it probable that abscesses in the brain can be treated advantageously on the same principles as abscesses in other parts of the body? (*Amer. Journ. Med. Sciences*, July 1884.)

Notes and Queries.

CARBOLIC SOAP-TABLETS.—Messrs. McDougall, Brothers, of London and Manchester, have sent us a neat pocket-case containing films of soap not much thicker than leaves of paper, and subdivided into small squares like postage-stamps. They purport to contain 20 per cent. of carbolic acid. For those who do not object to the strong odour of this powerful disinfectant, we can imagine nothing more handy than these soap-leaflets. After trial in the post-mortem room we find one of them quite enough to remove from the hands all smell but its own.

Bibliography.

Die Chemisch-microscopische Untersuchung des Harns. By Dr. O. Puhlmann. Third edition, rewritten. 8vo, pp. 39. Berlin: Hirschwald. 1885.

A Manual for the Practice of Surgery. By Thomas Bryant, F.R.C.S., etc. Crown 8vo, pp. 1,520, with 750 illustrations, plain and coloured; 2 vols.; fourth edition. 32*s.* London: Churchill. 1884.

A Practical Treatise on Disease in Children. By Eustace Smith, M.D. 8vo, pp. 844. 22*s.* London: Churchill. 1884.

A Course of Operative Surgery. By Christopher Heath, F.R.C.S., etc. Large 8vo, with 20 coloured plates; second edition. 30*s.* London: Churchill. 1884.

On Tumours of the Bladder. By Sir Henry Thompson, F.R.C.S., M.B., etc. 8vo, pp. 111, with numerous engravings. 5*s.* London: Churchill. 1884.

On some of the Responsibilities of the Medical Profession. By John J. Nason, M.B., J.P. 8vo, pp. 32. 1*s.* London: Churchill. 1884.

The Mouth and Teeth in Health and Disease. By J. Morley Dennis, F.L.S. 8vo, pp. 53, with illustrations. 2*s.* 6*d.* London: Simpkin, Marshall, and Co. 1884.

The Modern Operations for Cataract; being the Lettsomian Lectures for 1884. By R. Brudenell Carter, F.R.C.S., etc. 8vo, pp. 83. London: Macmillan and Co. 1884.

The Science and Art of Surgery. By John Eric Erichson, F.R.S., LL.D., F.R.C.S., etc. Eighth edition, revised and edited by Marcus Beck, M.S., M.B., F.R.C.S., etc. Two vols., large 8vo, pp. 1,168 and 1,249, with 984 illustrations. 42*s.* London: Longmans. 1884.

Tumours of the Ovary, Fallopian Tube, and Broad Ligament. By Alban G. Doran, F.R.C.S., etc. 8vo, pp. 189, with 32 illustrations. 10*s.* 6*d.* London: Smith, Elder, and Co. 1884.

*** Any of the foreign works may be procured on application to Messrs. Dulau, of Soho Square, W.C.; Williams and Norgate, of Henrietta Street, Covent Garden, W.C.; or Bailliere, of King William Street, Charing Cross.

Department of Public Health.

ON THE CHOLERA EPIDEMIC IN SOUTHERN EUROPE.

The epidemic of cholera which commenced in June last at Toulon has extended itself widely in the countries bordering the north-western coast of the Mediterranean. On June 20th, the first cholera deaths were recognised at Toulon. The disease continued without any very substantial increase until towards the end of the first week in July, when the deaths rose from fourteen to twenty a day, and the increase continuing, the fatal attacks between July 19th and 24th reached nearly fifty a day. From that date an abatement commenced, and although occasional cases still occur, the epidemic as such may be regarded as at an end in Toulon. In all between 800 and 900 fatal cases have occurred there. At Marseilles the first deaths were registered on June 27th. The progress of the disease was more rapid there than it had been in Toulon, and within eighteen days the fatal attacks numbered sixty, seventy, and even eighty a day. For about a fortnight, from July 10th to the 24th, the epidemic was at its highest; a steady fall commenced about the beginning of August, the daily deaths, however, still varied from five to twenty through the entire month, and it was only at the commencement of September that the abatement was so marked as to foretell the cessation of the prevalence in its epidemic form. In all, some 1,700 deaths from cholera have already been registered in Marseilles. From both Toulon and Marseilles the disease spread in several directions. First Arles and Aix were attacked, the disease maintaining itself somewhat persistently in both those places. A large number of other small towns and villages in the

south of France also suffered, but in none of them did any such extension take place as has characterised the outbreak in Perpignan and its neighbourhood. Perpignan was only attacked about the middle of August, but the town and vicinity have suffered severely, and the deaths from cholera which have occurred there cannot have fallen far short of 140.

Towards the beginning of August it was evident that the disease had crossed the Franco-Italian frontier, and although for about a fortnight no large mortality was recorded in any one place, yet it was evident that the diffusion was a wide one. About the 22nd of August it was reported that the city of Spezia had become invaded, and from the large number of deaths that were at once recorded, it is highly probable that these were by no means the earliest attacks. The greatest severity was manifested in Spezia during the first ten days of September, but the disease has clung with much tenacity to the place; the mortality still continues, and some 500 to 600 fatal attacks have already taken place there. Several of the northern provinces of Italy were almost simultaneously affected, and the infection soon after took a leap towards the south.

On about the 26th of August the city and province of Naples became infected, and in the city the disease has shown the greatest virulence manifested during the present epidemic. For about a week the daily deaths recorded were but few in number; early in September a sudden aggravation took place, the number of fatal attacks running up to some 50 to 100 a day; the increase progressed rapidly, and on September 9th the mortality was as high as 493. For several days this heavy death-rate was all but maintained, and then after the second week of the month a diminution manifested itself, the daily deaths diminishing down to about 200 at the beginning of the fourth week of the month. Since then a further abatement has taken place, the daily mortality having fallen first to some fifty to sixty, and later still to some twenty-five. The fall has, however, by no means been a steady one, but, as is nearly always the case with cholera, it has been marked by occasional and sudden bursts of a higher mortality. In all, it is evident that by the middle of October not far from 6,200 cholera deaths had been registered in the city, and taking the previous history of cholera epidemics

in Naples into account, as also the deplorable sanitary condition of the city, it is much to be feared that the final disappearance of the disease may for some time be postponed. Amongst the other principal Italian towns that have been infected those of Busca and Genoa deserve notice. Busca, in the province of Cuneo, in the northern portion of the Peninsula, suffered severely; the outbreak was, however, of limited duration, being mostly confined to the month of August, since which date it has not been separately referred to in official records. As many as ninety-one deaths were, however, recorded during the brief period of the prevalence there. Although occasional cases were reported from the province of Genoa at intervals from the middle of August until the end of September, it was not until the close of that month that the mortality became large, and it was then that the disease spread into the city. This occurrence was soon followed by a heavy mortality there, the daily number of deaths during the last week of the month varying from about twenty to nearly fifty. The epidemic still prevails there, and by the middle of October they had reached to over 340 in number. The returns, as regards the vast majority of towns and villages, have, however, been recorded in connexion with the vital statistics published for entire provinces, and although it is impossible to regard the returns which have hitherto been issued as strictly accurate in their details, yet merging the deaths known to have occurred in specified places with those belonging to the provinces in which these places lie, some idea of the extent of the Italian epidemic may be obtained. Taking the provinces concerning which the most trustworthy evidence can be obtained, the cholera deaths which occurred up to October 20th may be distributed as follows:—

Provinces.	Number of Cholera Deaths.
Alessandria	31
Bergamo	358
Brescia	41
Campo-Basso	63
Cremona	108
Cuneo	529
Ferrara	16

Provinces.	No. of Cholera Deaths.
Genoa	502
Massa Carrara	119
Milan	13
Naples	6,842
Parma	136
Rovigo	36
Spezia	549
Turin	118
	9,461

From this it will be seen that by far the largest diffusion of the disease has occurred in the northern portion of the kingdom, the intensity of the epidemic in the southern half having mainly manifested itself in the city and province of Naples. To the deaths above recorded must, however, be added over ninety in Caserta, forty-nine in Reggio d'Emilia, eleven in Porto Maurizia, and several hundreds distributed throughout other smaller places, making in all a total not falling short of 10,000.

Although cholera was for many weeks near to Spain, at Perpignan in the department of the Pyrénées Orientales, it is more than probable, in view both of the little communication which takes place between that portion of France and Spain across their mountainous boundary, and of the locality of the district which was first attacked, that Novelda, Montforte, and Elche, and the seaport of Alicante itself, all towns in the province of Alicante, received their infection by sea. Indeed, the conveyance of the disease by land has not been suggested; if it took place the poison must have traversed a hitherto uninfected tract of between three or four hundred miles in length; and there is every reason to suppose that if the contagium was not conveyed from French ports to Alicante directly, yet that it was so conveyed indirectly by means of traffic reaching the latter place after touching at some seaport on the northern shore of Algiers or neighbouring country. But little is known of the Spanish epidemic: even its true character has been called in question, and whilst official reports have admitted the existence of cholera and

have recorded the number of attacks and deaths, local reports have denied the facts. It is, however, certain that the quarantine measures on which Spain relies were put in force as regards the infected provinces, and although the comparatively limited spread of the disease in Spain is not yet satisfactorily explained, yet there can be no doubt that cholera has prevailed in the provinces of Alicante, Tarragona, and Lerida. So far as can be learned, the disease first made its appearance at Novelda, some eighteen or twenty miles by rail from the town of Alicante, towards the end of August; the first deaths were made public at the beginning of September, and as regards the province of Alicante cholera deaths have been almost daily recorded there ever since. In that province there had been up to the middle of October nearly 190 fatal attacks, whereas from the provinces of Tarragona and Lerida, the numbers do not appear to have exceeded some thirty and some half-dozen respectively. The Spanish epidemic was thus mainly centred in and about Alicante on the south-eastern coast line; it was most severe at its onset, and for some time past the daily record of deaths in all the affected places together has not exceeded ten. The disease, however, still continues, and up to the middle of October from one to about four deaths were still recorded every day.

This history of the epidemic up to the present date is necessarily very incomplete, but the facts which it embodies suffice to teach some lessons, having an important bearing on the future progress of this disease, both in so far as this country is concerned and also from an international point of view.

In the first place, it teaches anew the value which attaches to the two methods which are adopted in civilised countries to prevent the importation of cholera. When the last International Sanitary Conference met at Vienna in July 1874, the system of quarantine both by land and by sea, and the system of medical inspection supplemented by isolation, were fully discussed by the delegates of the nineteen European States who were represented. The first conclusion which was arrived at was that, considering land quarantine to be both impracticable and useless, in the face of the numberless and daily increasing methods of intercommunication, and in view of the serious influence they exert on commercial interests, the Conference

rejected land quarantine. To this Italy assented; France, however, was one of the few countries which voted against the conclusion. From that date to the present one, every spread of cholera, in which an attempt has been made to carry out a system of land quarantine, has gone to prove the wisdom of the conclusion. Never, perhaps, was land quarantine more rigidly enforced than during the Egyptian epidemic of 1883; it was maintained by the aid of bayonet and bullet; it was so carried out that the needed supplies to populous districts were stopped, and there is reason to believe that in some localities as many, if not more, died of privation than of cholera. But no such measures of land quarantine could altogether stop intercommunication; the more rigidly they were maintained the greater was the inducement to break through them, and the existence of one single point of leakiness in any such sanitary ring fence at once enabled the infection to flow out. In short, in face of sanitary cordons maintained with a strictness that savoured of barbarity and cruelty, cholera spread steadily along the lines of human intercourse and showed itself throughout the country. France, however, clamoured for more and more quarantine, and when this year the disease made its appearance at Toulon the French were so far consistent as to endeavour to check its spread by some spasmodic efforts in the same direction. The process was, however, shown to be useless almost before it could be put into practice, for it was found that the inhabitants of Toulon instead of assenting to be confined within their stricken city had begun to flee right and left. A curious effort was then made to trace them by means of their railway tickets, but this was hardly commenced when it was discovered that the disease had already been imported into other neighbouring localities, and the onset of the outbreak at Marseilles led to the abandonment of the scheme. The attempt to maintain any efficient sanitary cordon utterly broke down and then the fumigation of persons supposed to have come from infected localities was largely carried out. How any trust could ever be placed in this system of fumigation by persons moving in scientific circles, it is almost impossible to conceive. Even assuming that a passenger arriving from a cholera-infected town had already contracted the poison, no attempt to blind or suffocate him or to fill his pockets with the

fumes of sulphur or other chemical substance could possibly stay the operation of a contagium which has its principal seat of action in the intestines, and no such process could in any way influence the almost certain infection of the latrine, cesspool, or sewer, which would shortly receive the bowel discharges of the infected individual. Indeed, after a while, medical and public opinion seemed to revolt against the absurd practice and it was allowed to die a natural death.

The delegate selected by the Italian Government to represent the views of his country at the Vienna Conference, was one of the majority voting in favour of the conclusion to which we have referred. But his influence, backed as it was by an almost complete unanimity amongst his brother delegates, failed to convince his fellow-countrymen, and the urgent demands that Italy made last year for concerted European action in the matter of quarantine will be remembered especially in connexion with the strong language which was used by the public press against this country. Italy believed thoroughly in quarantine, both by land and by sea, and on the occurrence of cholera in France that system was organised on the Franco-Italian frontier, as well as in the Italian ports.

Land quarantine measures were adopted on a large scale, troops were engaged to enforce it, and lazarettos were established in which to confine intending immigrants. The frontier too, being of a mountainous character and not being furnished with such numerous roadways as to make them difficult of control, appeared favourable to the scheme. But the month of July was not passed before cholera had been imported from France, and notwithstanding the efforts which were made to isolate the daily increasing number of infected houses, the disease spread without let or hindrance, first throughout the northern part of the Peninsula, and then to districts in the south; the lazarettos themselves becoming some of the most dangerous of the many centres of infection which had become established. In short, one of the most systematic and costly organisations for the maintenance of land quarantine utterly failed to effect its intended object.

As regards quarantine by sea, the Vienna Conference, in dealing with the measures which ought to be adopted in the ports of

Europe, recommended that whenever cholera should invade Europe the system known as that of medical inspection should be adopted; they added, however, that for those States which preferred to maintain quarantine the Conference had established certain regulations which should be held in view. This recommendation was embodied in a resolution, and with the single exception of the Spanish delegate who abstained from voting, it was adopted with unanimity. The failure of quarantine measures by sea is not conclusively shown as the result of the existing epidemic, because it is not yet proved that Spain received its infection by sea; but the system has so often failed before that the Conference had hardly any alternative but to give to sea quarantine measures a place second to that of medical inspection.

Perhaps the greatest evils connected with quarantine, and especially with land quarantine and its sanitary cordons, are the panic which is occasioned by the mere anticipation of the system being put in force, and the false sense of security which belief in the efficiency of the system engenders.

The present epidemic has afforded abundant proof of the former evil. Spezia was one of the towns around which a sanitary cordon was placed. Cholera came upon the town with remarkable suddenness, and had spread somewhat considerably before any official action was taken. But directly the actual prevalence of the disease was fully recognised orders were given for troops to be hurried up in order to surround the place; the inhabitants, and especially the poorer and more ignorant amongst them, at once took alarm, a flight ensued, and it is estimated that some 15,000 persons, out of a total number of from 30,000 to 40,000 inhabitants, fled from their homes in order to avoid being confined in a disease-stricken town. A regular stampede ensued; the railway station was besieged night and day, by people who cared but little where they were conveyed to, so long as they could get away. Some indeed escaped to the mountains carrying with them clothes and bedding, but without any forethought as to how life was to be maintained.

Any more effectual method for distributing the disease broadcast and for securing a wider spread for the epidemic could hardly have been devised, for before the stampede took place

there had been a large number of deaths in the town, and it is hardly possible that amongst those who escaped there were none who carried with them the infection of the disease. The experience of Italy does not stand alone as regards the production of panic. The attempt to control the movements of people in southern France only made them more anxious to get away, and thousands escaped from Toulon, Marseilles, and other places, whose movements it was impossible to trace.

To a great extent this state of panic was engendered by the utter state of unpreparedness on the part of the authorities to cope with the early stage of the epidemic. The countries attacked had pinned their faith to the efficacy of quarantine, and believing in its power to protect them, other measures were to a great extent ignored. Had the inhabitants known, as the people of England know, that they were not to look to quarantine measures for their safety, means would doubtless have been adopted to remove the conditions of excremental fouling of air and water which so notoriously prevail in southern Europe, and which are particularly rife in the majority of the places that have suffered from cholera during the present year. Cholera in previous years has been by no means an unmixed evil for England. Its appearance in our midst, and, still more, the anticipation of its appearance, has on several occasions given the greatest possible stimulus to sanitary legislation and to efficient health administration; indeed, we should not go far wrong if we said that to cholera we owe the largest amount of the security against epidemic disease and death that we now possess. Even the existence of cholera in Egypt last year, and again in southern Europe this year, has secured for us a greater amount of safety than we have hitherto possessed, and the measures that have been adopted and inaugurated will in the end materially strengthen our system of sanitary defences.

England has so far been all but free from any cholera importation during 1884; but one occurrence which was reported will suffice to show how our system would work if the need occurred. Early in September the Italian mail steamer *Abyssinia* arrived off Cardiff, and the customs officers notified to the port sanitary authority that there was sickness on board. The vessel had come from Genoa; and a few days after leaving Marseilles, where she

had touched during the height of the epidemic there, two of her crew were seized with choleraic diarrhœa. They were isolated on board, but neither of them had recovered when they arrived off Cardiff. At the place appointed for the inspection of vessels having sickness on board the *Abyssinia* was visited by the medical officer of health for Cardiff, and the two men in question, being the only ones who were ill, were removed to a hospital maintained for the purpose by the port authority on the Flatholm Island in the Bristol Channel. The sick being thus efficiently isolated, the crew and passengers were, under the Order issued by the Local Government Board, detained a short time in order to see if any others had become infected, and a sufficient time having elapsed without the occurrence of any further illness they were allowed to land, and the ship was effectually disinfected. All the persons who were permitted to land had, previously to leaving the vessel, been required under the Order to give their names and the places of their destination with a view to their being further subjected to a brief period of supervision by the sanitary authorities into whose districts they moved. Of the two men who were removed to the Flatholm Hospital one died of the effects of his attack, and this case affords the nearest approach to the importation of cholera which we have this year experienced.

The secret of success in carrying into effect the system of medical inspection and isolation is to be prepared beforehand, and it is impossible to urge too strongly upon local authorities, whether on the coast or inland, the adoption of such an organisation and the establishment of such means of isolation as shall enable them to deal with imported infection in its earliest stage. Possibly the risk of cholera infection which this country will run next year may be greater than it has been during the present one, and it will not be for need of warning if the disease should come upon sanitary authorities who are unprepared. During the past few months the ports of Great Britain have been visited by medical inspectors appointed for that purpose by the Local Government Board, the weak points in their sanitary defences have been pointed out to them, and it may be hoped, as the result, that measures are now in progress to make them good. Especially in so far as activity in this direction leads sanitary

authorities to put their districts in a thoroughly wholesome state, and to adopt beforehand all needed measures of cleanliness, such action tends in the end to real economy. In this connexion it is well to remember the closing words of the memorandum on "Precautions against the Infection of Cholera," which was issued by Dr. Buchanan, F.R.S., the medical officer of the Local Government Board, on the appearance of cholera in Egypt in 1883. They were as follows:—

"It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this Memorandum refers cannot in any event be regarded as wasted. The local conditions which would enable cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of cholera, create and spread other diseases: diseases, which, as being never absent from the country, are in the long run, far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera would, to their extent, though cholera should never re-appear in England, give amply remunerative results in the prevention of those other diseases."

As having a bearing on this point it is also worthy of note that the value of being prepared in advance has been strikingly illustrated during the course of the Italian epidemic. The contrast between Naples and Rome supplies the illustration. In Naples cholera, when once imported, found in the results of centuries of sanitary neglect a soil congenial to its rapid development, and terribly the city has suffered in consequence. But Rome had learned a lesson which even the history of previous cholera epidemics had not impressed on Naples. The eternal city had provided itself with an abundant and wholesome water-supply, and with an efficient system of sewerage, and it had, in addition, adopted other measures calculated to promote the health of its inhabitants; the result being, that although cholera was on five separate occasions imported into the city no difficulty was experienced, by means of measures of isolation and other sanitary precautions, in preventing any spread of the infection.

This lesson may not be thrown away on southern Europe, and it should be taken to heart by all sanitary authorities in this

country. The protest which is now being made by many educated Frenchmen and Italians against quarantine also argues well for the future, and the opinions which have been expressed in the *Opinione,* as to the futility of trusting to measures of quarantine instead of promoting the healthiness of cities, towns, and villages, will, it may be hoped, not be thrown away on the people to whom they have been addressed.

NOTES OF AN OUTBREAK OF LEAD POISONING AT TREDEGAR, MONMOUTHSHIRE.

BY GEORGE ARTHUR BROWN,

Medical Officer of Health for the Tredegar Local Board.

THE urban sanitary district of Tredegar, containing an estimated population of 18,000, adjoins on the east the urban sanitary district of Ebbw Vale. By an arrangement between the Tredegar and Ebbw Vale Local Boards, the north-eastern portion of the district of the former is supplied with water from the reservoir of the latter. The portion of the Tredegar district thus supplied with water comprises the sub-districts of Sirhowy in the county of Monmouth, and Duke's-town in the county of Brecon; it covers an area of about 150 acres and contains an estimated population of 3,200, consisting, with few exceptions, of the workpeople and their families employed by the Tredegar and Ebbw Vale Iron and Coal companies. The reservoir is formed on the millstone grit at the northern outcrop of the great South Wales coalfield, and is situated on elevated moorland towards the north of the district which it supplies.

In the autumn of 1882, the water from the Ebbw Vale reservoir was brought to Sirhowy and Duke's-town by a principal main of 6-inch cast-iron pipe, diminishing to 3-inch. It reached the district at a point considerably higher than any dwellings which have to be supplied, and passed by gravitation to each part of the area it had to serve. By the spring of 1883 a large number of the dwellings in Sirhowy had had the water laid on.

These dwellings are for the most part built in rows, each row consisting of from ten to twenty houses. Accordingly, a lead main, as it subsequently transpired, was laid to the rows from the nearest point in the principal main, and was carried the whole length of a row—that is to say, from 150 to 300 feet—and from this again lead service-pipes were carried into each house. It therefore resulted that practically the whole water supply of the district was contained in lead pipes, cast-iron pipes being used only in the principal main. It should be added that the work was carried out by a contractor employed by the Ebbw Vale Local Board.

About six weeks after the water had been laid on to Sirhowy, a case of lead poisoning was brought to my notice in a youth of nineteen. The house in which he lived was situated in Sirhowy at about 180 yards distant from the principal iron main, and it was found, on analysis, that the water first drawn in the morning from the tap in the house contained over half a grain of lead per gallon. Shortly afterwards cases developed themselves in other parts of the district, and samples of the water were analysed by Mr. Turnbull, the Tredegar Iron company's analyst, and were shown to contain on an average nearly two-fifths of a grain of lead per gallon. On being apprised of these cases of lead poisoning, the Ebbw Vale Local Board forwarded four samples of water to the public analyst, Mr. J. W. Thomas, F.C.S., of Cardiff. Sample A was taken as it left the service reservoir; sample B from a house in Ebbw Vale; sample C from a house in Duke's-town; and sample D from a house in Sirhowy. The following is a copy of Mr. Thomas's report:—

Expressed in parts per 100,000.												
Sample.	Total solid matter.	Albuminoid Ammonia.	Free Ammonia.	Nitrogen as Nitrites & Nitrates	Total Nitrogen.	Previous Sewage and Animal contamination.	Chlorine.	Magnesia Salts.	Hardness. Temporary.	Hardness. Permanent.	Hardness. Total.	Lead.
A	4·6	·009	·002	0	·009	0	·7	Very moderate	·4	2·0	2·4	none
B	4·6	·010	·002	0	·010	0	·7	same	·3	2·0	2·3	traces.
C	4·5	·009	·002	0	·009	0	·7	same	·5	1·8	2·3	traces.
D	4·6	·010	·002	0	·010	0	·7·5	same	·4	1·8	2·2	⅛gr. per gall.

From the foregoing table it will be seen that the water, as it issued from the service reservoir and as it was delivered to the houses in Ebbw Vale, was of great purity and was practically free from lead; and the same description applies to the water delivered to Duke's-town, the sample having been taken from a house in close proximity to the iron main. On the other hand, at the time the sample was taken, the water delivered to Sirhowy contained one-fifth of a grain per gallon. It was evident, therefore, that the presence of the lead in the water at Sirhowy was due to some cause local to Sirhowy.

In consequence of this report, an examination of the mains was made, and the Ebbw Vale Local Board then, for the first time, appear to have become acquainted with the facts detailed above, namely, that with the exception of the principal main, the whole of the mains and service-pipes throughout Sirhowy and Duke's-town were of lead. This state of things, coupled with the character of the water, which is remarkably soft and of a nature calculated to act upon lead, explained at once the cause of the prevalence of cases of lead-poisoning in the district referred to.

About fifty-two cases of lead-poisoning, in which the symptoms demanded treatment, were brought to my notice between the spring of 1883 and June of the present year; since that time no case has been reported to me. During the above-mentioned period I observed upwards of two hundred persons living in the affected district in whom the blue line on the gums was well marked, and who were undoubtedly under the influence of the poison; in these, however, no symptoms had developed themselves causing them to seek medical advice. In the majority of those seeking treatment colic was the prominent symptom, accompanied for the most part by obstinate constipation. In every case there were evidences of greater or less impairment of nutrition and in nearly all the peculiar sweet smell of the breath, described as a very constant symptom of lead-poisoning, was readily recognised. Wrist-drop was present in nine cases; of these eight were affected in both wrists and one in the right wrist alone. I saw in Dr. Coates's practice two interesting cases in members of the same family:—A girl, aged nineteen, after suffering severe abdominal pain and constipation

lost power over the wrists, and shortly afterwards became subject to epileptic attacks of an exceedingly severe type, the menses also becoming suppressed. Her brother, aged twenty, in addition to suffering from wrist-drop on both sides also lost considerable power in the legs; he walked with a gait strongly suggestive of locomotor ataxy; patellar reflex was absent and ankle clonus was present, and the muscles of the leg, notably the peronei, were distinctly wasted. In both cases the blue line was deeply marked. These cases completely recovered after discontinuing the use of the water and undergoing treatment.

I observed, in several instances, the fact that in certain families there existed far greater susceptibility to the effects of the poison than in others. I was asked by Dr. Coates to see a man, under his care, who was suffering severely from all the symptoms diagnostic of lead-poisoning; a sister in the same house was suffering similarly, though to a less degree; the same day I was called to another sister who lived in the neighbourhood and I found her suffering from well-marked symptoms of plumbism. In two cases the symptoms suggested gastric ulcer and the patients had, in the first instance, been treated for this complaint. Contrary to what has been observed by Tanquerel and some others, children appeared to be less susceptible of the action of the poison than adults; in fact no severe case was brought to my notice in a patient under eighteen.

Upon it being demonstrated that lead was present in the water supplied to the district the inhabitants were cautioned against using the water for drinking or cooking purposes, and steps were at once taken by the Ebbw Vale Local Board to substitute iron mains in all places where lead had been used, and so to arrange that in no instance should there be any great length of service-pipe. This work has been carried on with reasonable despatch and, at present, the water supplied to the district is to all intents pure and free from lead.

With regard to the treatment of these cases of lead-poisoning it may be said that in most of them opium was indicated and afforded marked relief to the acuter symptoms. The general treatment consisted, for the most part, in free purgation—generally with the sulphate of magnesia combined with

sulphuric acid and carminatives. Iodide of potassium was subsequently administered where the muscles were affected and recovery in most cases resulted. In those cases where this treatment combined with a tonic regimen did not result in the complete recovery of muscular power, faradisation caused marked improvement in the patient's condition and ultimately effected a cure.

THE PRACTITIONER.

DECEMBER, 1884.

Original Communications.

IRRITABLE SPINE, AND SPINAL MYALGIA IN PARTICULAR.[1]

BY S. J. GEE, M.D., F.R.C.P.
Physician to St. Bartholomew's Hospital.

Of all parts of the body the nervous system is that which performs the most numerous, most various, and most complicated functions. Hence the diseases of the nervous system partake of the same character; they are most numerous, various, and complicated. Hence, again, the diseases of the nervous system are most difficult to explore. And there is one set of those diseases which is especially difficult: I mean those which consist in pain, and in little or nothing but pain. Your researches into these painful disorders place you almost wholly at the mercy of your patient; you can do little more than register what he or she tells you; you have few means of putting the accuracy of his statements to the test. Yet some sort of test is very necessary, because these painful affections occur for the most part in women; and women who suffer thus, usually suffer at the same time from another disorder which is

[1] Clinical Lecture, October 18, 1884.

the main cause of our difficulties, I mean, an uncontrolled disposition to exaggerate. Uncontrolled, and sometimes I suppose, uncontrollable; we do not believe that they all lie wilfully; but the result, so far as we are concerned, is just the same as if they did.

It commonly comes to this. You visit your patient with a candid mind, desirous to hear what she has to say, as in duty bound, so that you may afterwards do all the good to her our art can do. But you soon find that the more patient and attentive you are to the story, the more does it lengthen; there seems no end thereof in view; it flows, and as it flows, for ever will flow on. In young women there is often the opposite difficulty; they are not too voluble; indeed they will vouchsafe no information at all; they reply to your questions in monosyllables; they roll the bedclothes round them, and resist all your well-meant endeavours to discover the nature of the malady. And yet you cannot help thinking that in this taciturn manner the intention of the patient is the same as that of her loquacious sister, namely, to exaggerate.

Your examination over, you prescribe the treatment. At this stage you must expect one of two results. Either your patient will never admit that you do her the slightest good; very likely she will give you plainly to understand that you have made her worse. Or you will find that as soon as you have dispersed one set of disorders, new crops arise, and your task becomes like that of Sisyphus in Hades. Moreover, you are told by those who are more constantly than you in the company of the patient, that her conduct hardly tallies with her complaints. The question even arises whether hers is not altogether a case of imposture. But supposing that you dismiss this suggestion, yet there is so much about the patient which is not straightforward, that you are wearied with your vain attempts to get at the truth, and, if she be a hospital patient, you are glad to discharge her.

This is the reason why hysteria has almost come to be synonymous with imposture. Yet hysteria is a very real disease. There is a young woman at present in the hospital, suffering from paralysis of her limbs, blindness of one eye, deafness of one ear, and all hysterical. But the liability to exaggeration is not

peculiar to hysterical diseases, unless you call all the diseases of women hysterical. The patient, whose case I mean to bring before you to-day and who led me to make these introductory remarks, was suffering from a disorder which might, like any other disorder in women, be associated with signs of hysteria, but which is not by any means necessarily hysterical. She has what is called an irritable spine.

The word, irritable, used in this way, means no more than painful. An irritable uterus means a painful uterus. The term seems to have been introduced about sixty years ago.[1] Older terms, used in what is essentially the same sense, are rhachialgia and notalgia.[2] As these Greek words signify, the disease consists in pain referred to the spine and back. There is pain and nothing else; nothing else discoverable during life, and no doubt nothing else would be discovered on an examination after death. The pain constitutes the whole of the disease.

Now this would seem to be a very simple notion. Yet you will find the current notion of irritable spine to be anything but simple, to be indeed most complicated, and for this reason. The earlier writers upon the disorder (such as Player, Brown, Darwall, Teale, and Griffin), considered this spinal pain to be due to an irritable, or irritated, or "subacute inflammatory state"[3] of the posterior roots of the spinal nerves, or even of the spinal marrow itself. Any other pains or disordered functions, which concurred with the pain in the back, and which could by any possibility be supposed to be due to disease of the spinal nerves, were attributed to the irritable spine. In other words, the irritable spine was thought to be the cause of a host of other aches and troubles. And this opinion continues to prevail. For instance, in one of the latest and best text-books, these are symptoms which are spoken of as being in some way dependent

[1] See Teale, *A Treatise on Neuralgic Diseases Dependent upon Irritation of the Spinal Marrow, &c.* London, 1829. On page 5 there are the following references: Mr. R. P. Player, "On Irritation of the Spinal Nerves," *Quarterly Journal of Science*, vol. xii., p. 428, Dec. 10, 1821; also Thomas Brown, "On Irritation of the Spinal Nerves," *Glasgow Med. Journal*, May 1828; John Darwall, "Observations on some Forms of Spinal and Cerebral Irritation," *Midland Med. and Surgical Reporter*, May 1829.

[2] Jos. Frank, *Trans. by Bayle*, iii. 245.

[3] Teale, p. 18.

upon the spinal irritation, namely, a lump in the throat, palpitation, dyspnoea, spasmodic cough, gastralgia, nausea and vomiting, irritability of the bladder, or suppression of urine. In foreign books it is just the same. I believe all this to be a mistake. The symptoms, just enumerated, may and do sometimes concur with an irritable spine; but they are not the effect of it. Indeed some of the symptoms which have been supposed to be effects of irritable spine, are much more likely to be its cause; I allude to menorrhagia. You will understand this better a little further on.

We will confine our attention to the simple notion of pain referred to the region of the spinal column. There is pain, and nothing but pain; no reason to suspect disease of the vertebral column, of the spinal marrow, or of its membranes. The pain extends over the width or length of two or three vertebrae, seldom more. The most common situation is along the nape of the neck, or between the shoulder-blades; sometimes, but not often, lower down in the loins. The painful part is also tender to pressure made upon or alongside the spinous processes. The overlying skin is often tender. The application of heat or galvanism has the same effect, produces pain. But, at this point of your examination, you must distinguish two cases.

Sometimes, if you follow the course of the sensitive nerves which emerge from the tender or painful spot, you will find other spots where the patient complains of pain, spontaneous or produced by pressure, in the nerve at a distance from the spine. This is neuralgia. And so you get an irritable spine in connexion with neuralgia of the cervical plexus, or cervico-occipital neuralgia; neuralgia of the brachial plexus, or cervico-brachial nerves; neuralgia of the intercostal nerves; and much less commonly in lumbo-abdominal anterior crural neuralgia, and sciatica.

Sometimes you cannot make out any pain or tenderness in the course of the nerves which correspond with the spot of pain in the spine. There may be pain elsewhere, besides in the back, but there is no anatomical connexion between the two seats of pain. This kind of irritable spine was deemed by Dr. Inman of Liverpool to be due to myalgia: and I believe that he was right. By myalgia he means muscular pain, pain referred to

the tendinous extremities of muscles. Myalgia is closely allied to fatigue. Speaking generally, we may say that myalgia is due to one or both of two things: either the muscle is overworked, or the whole health of the patient is lessened, so that exertion which could be easily borne in a robust condition becomes overwork in the weak condition, even though the exertion be small. The muscles of the vertebral column are especially prone to be overworked, because "there is scarcely a single motion of the body in which one or more muscles attached to the spinous processes are not brought into operation, and there is, therefore, throughout the whole day (except during absolute rest), a constant and unremitting strain upon the fibres by which the muscles are inserted" into the spinal column. (Inman, *On Myalgia,* p. 226.)

This spinal myalgia is increased by any movement which brings the affected muscles into play, and is diminished by any position which relaxes the muscles, for instance, by lying down perfectly still, and by artificial supports of the nature of stays.

Over and above the fact that women are not capable of so much muscular exertion as men, there are reasons why women should be especially prone to myalgia of all kinds, and these reasons are, menstruation, childbearing, suckling.

Much more might be said upon these topics, but I think I have said enough to enable you to understand the case which I will now narrate, and which I consider to have been an instance of irritable spine, due to myalgia.[1]

[2] *September* 9, 1884.—C. W., aged forty-two years, married, has had eleven children, of whom four are now living, two were stillborn, and she has had one miscarriage. Patient is a cook and hotel-keeper, she said that she had been very much overworked, kept up very late at night, and obliged to rise early in the morning. She has three times lost all power in her legs. The first time was ten years ago, the second three years ago, and the third about six months back. On the first and second occasions, the loss of power began during pregnancy, at about the sixth month. The second time (three years ago), labour was artifi-

[1] For question of diagnosis from spinal caries, see Sir James Paget's Lectures, p. 227.

[2] Notes by Mr. Harold Johnson.

cially induced at six and a half months, as power was already lost in the legs, owing, it was supposed, to pressure. The last time (six months back), the loss of power came on whilst patient was keeping her bed on account of the pains now complained of. These are: A sharp darting pain in back, between the shoulder-blades, which leaves a dull aching and tingling sensation, aggravated by movement, and extending more on the left side than on the right, and especially over and near the spines of the first and sixth dorsal vertebrae. She also feels a pain which precludes movement in the muscles of extension of the head. In the lumbar region there is a well-defined narrow band of pain (a feeling of tying tight,) extending from spine of second lumbar vertebrae to crest of ilium. A sharp breaking pain is felt in the middle of the arm on raising it, when extended, just before it reaches the level of the shoulder, but not when flexed. On using arms a pain is felt between the shoulders, on the opposite side to that of the arm used. The muscles of arm also ache after use. A catch is sometimes felt in the epigastrium on taking a deep breath. The pain seems to have travelled downwards—that between shoulders coming first, then in back, and lastly in lumbar region. Her menstrual periods have been irregular for about eighteen months, since death of her husband, sometimes not occurring for five months at a stretch, and at others lasting for a fortnight. Patient is fairly healthy and well-nourished, complains of her weakness, and chiefly of pain in neck and back. Tongue clean; chest and lungs, nothing abnormal; heart natural; abdomen natural; urine 1022, acid, no albumen.

Sept. 20.—Hot douche prescribed, to be applied to spine once a day for ten minutes, at 105° F. To lie in bed.

Sept. 23.—Patient has found much relief from douche.

Sept. 28.—Suffering from toothache. Douche discontinued. Feels very much better as to pains in back, &c., since its application.

Sept. 30.—Complains of pain returning again since discontinuance of douche.

This woman had an irritable spine, due to myalgia of the muscles attached to the vertebrae. She may have been hysterical, as indicated by the paralysis of the legs (if paralysis it

were), but the myalgia was not hysterical, for such myalgia may occur in persons who are certainly not hysterical. She may have been an impostor, and I think she was in the sense which I explained at the beginning of the lecture, that is to say, I think that she exaggerated her sufferings. But I do not think she was altogether an impostor. The accounts she gave of her pains tallied too closely with the general notion of myalgia and irritable spine. If she were a mere impostor, she was deeply versed in the signs and symptoms of spinal myalgia. I believe that there was a certain amount of pain (how much I cannot say) which her words did not truly represent: she exaggerated her pains. And this, as I have frequently said, these patients always do; but this is no reason why we should treat them as if there was nothing the matter with them.

How should we treat them? The first thing to attend to is to see that they take food enough. Often they take very little food; especially if they suffer from concurrent nervous disorder of the stomach, what is called nervous cardialgia, gastrodynia, gastralgia. But take food they must: if they cannot or will not take much at a time, they must feed often. A moderate allowance of alcohol, in form of stout, ale, or wine, may be reckoned as so much food. The muscles must have an opportunity of being well-nourished, or your other treatment will do little good.

Secondly, the muscles must be rested. The pain is of the nature of fatigue. The muscles of the neck and back cannot be rested unless the spine be supported in its whole length: the patient must lie on a couch, or recline in a very easy chair, with a long high back, and with elbows, so that the weight of the arms is taken off the spine. Yet here also is a difficulty. A prudent man thinks twice, or a dozen times, before he condemns a young woman to the sofa. There is danger that she will never rise from it, and will be a burden to herself and all her friends and relatives for the rest of her life. Beware of insisting too much upon the repose of the couch; it were sometimes far better that they should continue to complain of their pains. In this dilemma, the best advice I can give you is, that you should recommend a certain amount of reclining: and carefully watch lest your patient show signs of becoming a

slave to the sloth of the sofa. With the better sort of women there is little fear of this: they prefer an irritable spine to laziness.

Another means of resting the muscles which perhaps occurs to you, is well-fitting stays. But on second thoughts you will see that stays do not come high enough to support the head and shoulders; and it is here that spinal myalgia most commonly shows itself.

Local applications to the spine, more or less anodyne, are useful. Warmth for instance: our patient declared she was much relieved by a douche of hot water to the spine. Belladonna liniments are useful.

Lastly, I think that patients who have once developed an irritable spine, seldom altogether lose it; or at least they will seldom confess that they are altogether free from pain in the back.

ERGOT OF RYE: AN INVESTIGATION INTO ITS ACTIVE PRINCIPLES.

BY DR. R. KOBERT,

Assistant in the Pharmacological Institute, Strasburg.

In ergot there are various poisonous principles which I have named ergotinic acid, sphacelinic acid, and cornutin, respectively.

I. The ergotinic acid is obtained if one precipitates the watery extract from ergot with neutral acetate of lead, and then adds to the filtrate an ammoniated solution of acetate of lead. Thereupon there results a thick white precipitate of ergotinate of lead.

The ergotinic acid is the active substance of Bonjean's extract, of Wernisch's dialysed ergotine, and of the sclerotinic acid of Dragendorff and Podwyssotzki. The action of this is five times as powerful as that of sclerotinic acid, and is, in short, the following :—

If an injection is made under the skin, or into the blood, there results paralysis, commencing in the spinal cord and ascending to the brain, dilatation of the blood-vessels through paralysis of the vaso-motor centre, and lowering of the blood-pressure.

But even in the greatest doses, the acid (that is to say its sodium salt), never causes uterine contractions, though Markwald and Kronecker have stated the opposite; and it never causes gangrene as Rossbach and Nikitin maintain.

By introducing the ergotinic acid into the gastro-intestinal canal, there come on only the mildest of disturbances, and

even only after excessive doses, the symptoms being tingling in the tips of the toes, which is in fact an indication of the beginning of paralysis of the lower end of the spinal cord. Some 90 per cent. of the acid escapes absorption, being partially decomposed in the intestinal canal, and partially escaping per rectum unchanged.

The aforesaid decomposition can be produced by artificially digesting the acid with pancreas in substance, or by heating with diluted mineral acids; thereon there results an absolutely harmless base and grape sugar. Hence one must consider the ergotinic acid as a glucosidic acid.

II. The sphacelinic acid gets its name from *Sphacelia segetum*, the early name of ergot; this designation indicates at the same time the most prominent property which the acid possesses in that it causes gangrene.

It is obtained by extracting the ergot with absolute alcohol after it has been freed of ergotinic acid and alkaloids. It must then be freed from fat and colouring matters. From thirty grammes of secale one can obtain a dose fatal to a fowl, and from 200 grammes a dose large enough to kill a small pig. Death results, if the drug has been taken into the stomach, with symptoms of gangrene. This may attack very different parts, *e.g.* the comb, wattle, tip of the tongue, soft and hard palate, balls of the feet, ears, skin, and extremities: in the case of fowls, whole limbs may drop off. The microscopic examination of the gangrenous parts show an hyaline exudation on the walls of the smaller arteries, which almost totally occludes their lumen. In rabbits, guinea-pigs, and cats, no gangrene occurs, for the vessels of these animals do not give out a hyaline mass under the action of the poison, but their walls degenerate so that there result numerous small effusions of blood in the most various organs. The above are the microscopic effects as found by Professor Recklinghausen and described by him. In the digestive canal there are moreover swelling of the solitary glands and Peyer's patches, which may lead to their breaking and necrotic detachment. As regards the blood-pressure one sees that the vessels contract strongly and so cause the blood-pressure to rise. The heart is unaffected. In poisoning with very small doses it is only in the central nervous system that disturbances occur,

which begin with thrombosis, due to the hyaline contraction of the vascular wall; probably herein consists the tabes from ergot described by Tuczeck.

On the uterus the sphacelinic acid acts by causing contractions, and as a matter of fact genuine tetanus of the uterus.

III. The alkaloid in ergot which has been named cornutin, is not the only alkaloid which occurs in the drug, but it is the only energetic one. The ergotenin of Tanret, which has been prepared by myself as well as obtained from Tanret himself, proved without physiological effect. The cornutin, on the contrary, works very powerfully in doses of one thirty-second part of a milligramme. Frogs fall into a state of spastic rigidity which continues many days, and ends with degeneration of the muscles. In the cases of convulsive ergotism observed in human beings, a remarkable rigidity of the muscles comes on, and this is accompanied by fibrillar atrophy.

With warm-blooded animals 0·5 milligramme is sufficient to cause salivation, vomiting, diarrhœa, and active movements of the uterus. These are, however, not tonic but clonic. The blood-pressure is raised by the cornutin and the vessels are contracted.

Finally, it may be added that only preparations of ergot should be used which contain sphacelinic acid and cornutin, while the employment of ergotinic acid is utterly useless.

RESEARCHES RELATING TO THE PATHOLOGY AND TREATMENT OF CHOLERA.

BY T. LAUDER BRUNTON, M.D., F.R.S., AND P. H. PYE-SMITH, M.D.

(*Continued from* p. 361.)

Some time previously, my friend Professor Schmiedeberg, now of Strasburg, had discovered and isolated a new alkaloid from a poisonous mushroom, the *Amanita muscaria* or *Agaricus muscarius,* and had investigated its physiological action. Among other things, he noticed that when given to animals it caused great dyspnœa.[1] At the same time the arteries became empty, so that when cut across hardly a drop of blood issued from them, the very condition which I have already mentioned as existing in cholera.[2] From a peculiar action which it exerts upon the heart of a frog, and which is removed by atropia, he administered atropia to the warm-blooded animals suffering from the symptoms just described, in the hope that it would counteract the effects of muscaria in them, just as it did in the frog. His anticipations were completely realised, and the symptoms at once disappeared after the antidote had been given. My friend had not thought at all of contraction of the pulmonary vessels as a cause of dyspnœa ; he attributed it rather to excitement of the nervous centre in the medulla oblongata, which regulates the respiratory movements, and the effect of atropia in removing the dyspnœa greatly puzzled him, for atropia itself excites the nervous centre, and ought, according to my friend's supposition, to have increased instead of removing the breathlessness.[3] Although he had only

[1] Schmiedeberg and Koppe, *Das Muscarin*, p. 50.
[2] *Op. cit.*, p. 57.
[3] *Op. cit.*, p. 56.

a very little of the alkaloid himself, Professor Schmiedeberg had very kindly given me some, and as soon as the idea that the dyspnœa was due to contraction of the pulmonary capillaries suggested itself to me I proceeded to test it by experiment. I first gave a rabbit such a dose of chloral hydrate as completely to deprive it of all sensibility, then put a tube in the trachea and connected it with a pair of bellows. I was thus able to inflate the animal's lungs at regular intervals and keep up respiration artificially when the animal could no longer breathe itself. I next opened the thoracic cavity so as readily to observe the slightest change in the lungs or heart. Fearing lest my wishes should lead me in the slightest degree to make erroneous observations, I obtained two assistants and made them tell me what they saw without my informing them of what I expected. In all the observations which we made, however, we perfectly coincided, and the results of my experiments being thus attested were carefully noted down. Our preparations being complete, I injected a little muscaria into the jugular vein. Scarcely was the injection finished when the lungs which had previously been rosy became blanched, the right side of the heart swelled up, the veins passing to it became enormously distended, and the left side of the heart almost empty. After allowing this state of things to continue for a short time, I injected a little atropia into the jugular vein—at once the effects of the muscaria disappeared, and everything seemed again to present its normal appearance. The lungs again became rosy, the right side of the heart and the veins contracted, and simultaneously the collapsed and shrunken left side of the heart regained its normal fulness.

This confirmation of my ideas regarding the cause of the dyspnœa induced by the administration of muscaria and the power of relaxing the pulmonary vessels which atropia was thus seen to possess, raised my hopes regarding its usefulness in cholera. But there were other points relating to the action of muscaria and of atropia which I wished to investigate, and I did not publish my results. Unfortunately my supply of muscaria failed me, and I have been unable to obtain any until a month or two ago, when Professor Schmiedeberg made some more and kindly sent me a fresh supply, as soon as he had finished

preparing it. Owing to other engagements I have not yet been able to prosecute my investigations, but hope shortly to do so.

I have hitherto proceeded on the assumption that Parkes's and Johnson's theory of cholera is correct, and that the stoppage of the circulation is due to contraction of the arterioles in the lungs. In poisoning by muscaria the right side of the heart seems to be almost as much distended as the great veins of the thorax and abdomen, and exactly the same condition is found in the post-mortem examination of persons who have died of cholera. But it is not certain that the right side of the heart is always distended during life even when the symptoms of cholera are present in their most pronounced form. Indeed it would

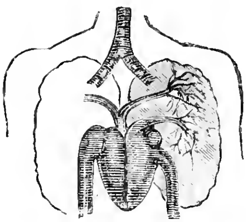


Fig. 1.—Normal.

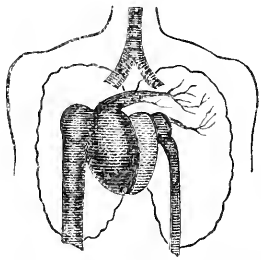


Fig. 2.—Contracted Pulmonary Vessels.

appear that the veins of the intestines and the vena cava are more widely dilated in cholera than in muscaria poisoning, and hold so much blood that very little of it reaches the right side of the heart, which is therefore almost as empty as the left. There are several reasons for this supposition. The first of these is that an increase in the size of the heart is not to be detected by percussion. On the contrary, it is smaller than usual.[1] The second is that the symptoms of cholera are very similar to those of collapse or shock, produced either by mechanical violence or by the presence of a powerful irritant, such as arsenic in the intestines. In this condition the veins are widely dilated.[2] The third is that nitrite of amyl has failed to be of service in

[1] Griesinger, Virchow's *Handb. d. Pathol. u. Therap.*, Bd. II. Abt. 2.

[2] See Fischer, *Ueber Schok.* Volkmann's *Klin. Vorträge*, and Brunton, *Practitioner*, Oct. 1873.

cholera. It was first tried in this disease by Drs. Hayden and Cruise of Dublin, who administered it by inhalation. It has the power of dilating the arterioles throughout the body, and, as I have shown, in those of the lung also.[1] It ought therefore to be of great service in cholera, by relaxing the spasm of the pulmonary vessels and allowing the blood to flow from the right to the left side of the heart. But it is found to be practically of little or no use. Indeed, Drs. Hayden and Cruise found that it increased the sufferings of the patient by interfering with respiration. From a knowledge of the action of the drug upon the blood I came to the conclusion that it would not hinder the breathing if it were injected subcutaneously instead of being inhaled, and I mentioned this in a paper which appeared some time ago in the *British Medical Journal*.[2] In consequence of my recommendation Dr. Smith employed it subcutaneously in a case of cholera, and found as I expected that it did not produce any difficulty of breathing. Its action on the circulation, however, was very slight. After each injection the brachial pulse was perhaps a little broader than before, but even this effect was insignificant and very transient.[3] Its action when inhaled was perhaps a little more marked, the pulse becoming somewhat stronger and the surface a little warmer than before, but the improvement was but very slight.[4] If the weakness of the pulse depends only on contraction of the pulmonary vessels, this result would be very astonishing, but if we suppose it to depend on dilatation of the great veins, this is exactly what we would expect.

A fourth argument in favour of the view that there is a great dilatation of the abdominal veins is afforded by the results of the injection of fluid into the circulation. It is evident that all the symptoms which I formerly attributed with Parkes and Johnson to arrested circulation in the lungs, and which I have mentioned in the beginning of this paper as proceeding from diminished circulation, will be produced as readily by dilatation of the abdominal and thoracic veins and stagnation of the blood in them, as by contraction of the pulmonary capillaries. In

[1] Brunton, *Brit. Med. Journ* , Jan. 13, 1872, p. 44.
[2] *Op. cit.*
[3] Smith, *Indian Med. Gaz.*, May 1, 1873 p. 123.
[4] Hayden and Cruise, *Op. cit.*

both cases there will be a very small stream of blood circulating through the pulmonary vessels, little respiratory change in the lungs, small pulse, empty arteries, a cold skin, and high internal temperature. The only difference will be that if the circulation is arrested by an obstruction in the pulmonary vessels, the right side of the heart will be distended with blood, but if the flow is arrested by enormous dilatation of the veins the blood will stagnate in them instead of the heart, and thus the right ventricle instead of being distended will be nearly empty, and the whole organ will be smaller than usual as percussion actually shows it to be. In cholera the profuse secretion from the intestines drains away a great deal of the watery constituents of the blood, and attempts have been made to restore this by injecting saline solutions into the veins. Almost immediately after the injections the symptoms of the collapse disappeared, but returned again after a short while. Part of this improvement was in all probability due to the improvement produced by the injection in the quality of the blood, which was previously too thick, and needed dilution, but it seems highly probable that the increase in its quantity was also useful. For Schiff has lately found that when by means of an operation he produces in animals dilatation of the vessels, the introduction of more liquid into them will again restore the circulation nearly to its normal state, but in a short while the effect of this new supply of liquid is lost, and matters return to their former condition just as in cholera.[1]

From all these facts it would appear that the veins are really dilated,[2] and if so, we must employ some remedy which will make them contract.

Now there are very few experiments on the contractility of veins, and hence we know very little about it. It has been found, however, that in the condition of depression or shock which follows severe injuries, in which the great veins are much dilated, the injection of digitalis has been very useful,[3] and if

[1] Schiff, *La Nazione*, Aug. 9, 1872, No. 222.

[2] About two months after reading this paper before the British Association at Bradford, I discovered that the theory of dilatation of the veins being the cause of the symptoms of collapse in cholera had been propounded by A. Eulenburg some years ago (*Wiener med. Wochenschr.* 1866, Nos. 90 and 91).

[3] Wilks, *Med. Times and Gaz.*, Jan. 16, 1864.

the theory of the causation of cholera collapse which I have advanced be correct, it is likely to prove useful in cholera also.

I do not know whether atropia has a similar action on the veins or not, but it has been lately tried in cholera with great success by Dr. Saunders, of Paducah, Kentucky.[1] He writes, "In the recent outbreak of cholera in Paducah, I treated a number of cases by sulphate of atropia hypodermically—one-fiftieth to one-thirtieth of a grain in water—with the happiest results. The more distressing symptoms—vomiting, purging, cramps—were relieved almost at once, followed by refreshing sleep, continuing in some cases for several hours. I found these effects, however, to follow only when the atropia was used in sufficient quantities to produce the specific scarlatinal rash, dry throat, and dilatation of the pupils. In some cases, the relief afforded was astonishing; the skin grew warm, the pulse rose, the surface, previously clammy and shrivelled, assumed its natural condition, and in some instances the patient slept soundly for ten or twelve hours, the bowels remaining undisturbed during the entire time. Of course you will not understand me as advocating the exhibition of the atropia to the exclusion of all other means, especially the use of calomel, to which I attach much importance. In the first case in which I gave the atropia I combined it with morphia (one-fortieth of a grain of sulphate of atropia to one-sixth of a grain of sulphate of morphia), and I think the combination is better perhaps than the atropia alone." I have already mentioned that my experiments with atropia in muscaria-poisoning had led me to expect great benefit from its employment in cholera, but my hopes being founded only on a supposition, viz., that it would benefit the disease because the symptoms resembled those of the poison in some though not in all particulars, I was unwilling to recommend its use until I had some positive facts to bring forward. I accordingly wrote to a friend in India desiring him to try atropia in cholera, some time before I became acquainted with Dr. Saunders's paper. I have had, as yet, no communication from my friend, and it is possible that more extended experiments may show more clearly that, as Dr. Saunders himself observes, atropia alone is not to be

[1] American *Practitioner*, July 1873.

absolutely relied on as a remedy in cholera; yet the very encouraging results he has obtained by its use are such as to show that it deserves at the hands of the medical profession a careful and extensive trial,

But any search after a remedy for cholera will be very imperfect if the action of any proposed medicine on the circulation alone is considered, and its effect on the intestinal secretion left out of account. For the latter is probably even more important than the former, and it is not unfrequently present when the changes in the circulation are either slight or absent altogether. I have therefore endeavoured to discover the action of atropia on the intestinal secretion. It has been found that secretion occurs in the salivary glands under two altogether different conditions, viz., when the nerves passing to them are irritated and when all their nerves have been completely divided. In the first case the gland only secretes so long as the irritation to the nerves continues, but in the second it goes on constantly and will continue to do so for days or even weeks, because the nerves have all been cut and in this way paralysed; the secretion is known by the name of paralytic secretion. Several years ago M. Moreau showed[1] that the same sort of paralytic secretion which has been observed in the salivary glands takes place in the intestine, and the method of experiment which he employed was this: He kept a large dog fasting for twenty-four hours, so that the intestines should be quite empty. He then chloroformed it and drew out the small intestine through an incision in the abdominal walls. He next tied four ligatures tightly round it at some little distance from each other so as to isolate three pieces or loops of intestine. These still remained attached to the mesentery, along which the vessels and nerves run from the spine to the intestine. Leaving everything else untouched, he carefully cut all the nerves going to the middle loop, and then returned the whole of the intestine into the abdomen, sewed up the wound, and left the animal to itself for several hours. On killing it and examining the intestine, he found that the middle loop was quite full, in fact distended like a sausage by a liquid like rice-water, while the other loops remained perfectly empty. All the loops had been under exactly the same con-

[1] Moreau, *Comptes Rendus*, 1858, p. 554.

ditions with the exception that the nerves of the middle one had been cut, and therefore this profuse secretion must be due to the division of the nerves. Professor Kühne analysed this secretion and also the rice-water-looking liquid which is secreted in cholera, and he found that their composition was identical, both being nothing more nor less than very watery intestinal juice.[1] Since the effect of cholera upon the intestine is the same as that of dividing the nerves, we are justified, I think, in believing that if anything can stop the secretion in this experiment it is likely to have a similar effect in cholera. Now atropia has the remarkable power of arresting the secretion from the salivary glands when their nerves are irritated,[2] and also from the sweat-glands,[3] rendering the mouth and skin quite dry. What its effect on paralytic secretion in the salivary glands is, I did not know, but thinking that it might possibly arrest the flow of fluid into the intestine, I repeated Moreau's experiment, and at the same time injected some solution of atropia into the vein of the animal. On killing it some hours afterwards, I found, somewhat to my disappointment, that there was fluid in the middle loop. The dose of atropia, however, was not very large, and I comforted myself with the hope that a large dose might do though a small one would not. Whether it does so or not I cannot say yet, for I have not been able to get any large dogs for several months past, and experiments on small ones are in this case very unsatisfactory. For in them the nerves are so fine that it is not easy to be certain that they have been all divided, and so if one should find an arrest of secretion after the administration of atropia, it might be simply due to imperfect division of the nerves and not at all to the action of the drug.

Foiled in my attempts to test the remedy in this way, I had recourse to another plan. M. Moreau found that when three loops of intestine are isolated in the way I have already mentioned, and Epsom salts are injected into one of them without hurting the nerves, the effect is much the same as if the nerves had been cut.[4] I have already said that secretion

[1] Kühne, unpublished paper read before the Medical Society of Amsterdam, 1868-69.
[2] Heidenhain, *Pflüger's Archiv*, v., p. 40.
[3] Sidney Ringer, *Practitioner*, Aug. and Oct., 1872.
[4] Moreau, *Bull. de l'Acad. Imp. de Médecine*, 1870, p. 629.

may be induced in two ways, and it is very probable that this secretion is due to irritation and not to paralysis. However this may be, I tried the effect of atropia upon it both by injecting a mixture of sulphate of magnesia, with sulphate of atropia, into the intestine; and by injecting sulphate of magnesia alone into the bowel, and solution of atropia into the veins. In both cases I used atropia in large doses, which not only dilated the pupil of the animal's eyes till the iris became almost invisible, but were, in fact, so large that we would hardly dare to employ proportionate ones in man for fear of causing immediate death.

Notwithstanding this, they had not the slightest influence upon the secretion, which was quite as copious as when no atropia whatever was used.

This result is disappointing and renders the use of atropia in cholera somewhat doubtful, for although the secretion caused by the sulphate of magnesia may be due to irritation, while in cholera it is due to paralysis of the nerves, yet if atropia cannot stop it in the former case it is much less likely to arrest it in the latter. It is, however, always difficult to foretell the effect of any drug under particular circumstances, and so I shall not at present speculate on the action of atropia upon paralytic secretion, but shall test it experimentally as soon as circumstances will permit.

The points in this paper to which I wish to direct special attention are—

1. Assuming Parkes's and Johnson's theory to be correct, and the impeded circulation in cholera to be really due either in whole or in part to obstruction in the pulmonary vessels, my experiments with atropia in muscaria-poisoning show that it is likely to prove beneficial to a certain extent in cholera, and since it has been found empirically to be useful in this disease, it ought to receive a fair trial at the hands of the medical profession.

2. The fact that the right side of the heart is not dilated during life in cholera patients, as well as the uselessness of nitrite of amyl which dilates the pulmonary vessels, show that Parkes's and Johnson's theory is imperfect, and that one of the most important pathological conditions in cholera collapse

consists in dilatation of the thoracic and abdominal veins. Any remedy which is to be useful in cholera must have the power of counteracting this condition, and the administration of digitalis in cholera collapse may be useful.

3. The profuse secretion from the bowels in cholera is due to paralysis of some of the intestinal nerves, and a remedy which will arrest it is still a desideratum.

Report of the Committee, consisting of Dr. PYE-SMITH, Dr. BRUNTON (Secretary), *and* Mr. WEST, *appointed for the purpose of investigating the Nature of Intestinal Secretion.* (*From the Report of the British Association for the Advancement of Science for* 1874.)

For some time the opinion has prevailed among physiologists that the nervous system not only exerts an influence upon the calibre of the vessels supplying glands with blood for secretion, but that the secreting cells themselves are excited to action by nervous stimuli. So firmly, indeed, has this opinion been held, that Pflüger's discovery of nerves terminating in the secreting cells has been almost universally accepted, notwithstanding his failure to demonstrate these structures to others. Partly, no doubt, this belief has been due to the high personal consideration in which this distinguished physiologist is justly held, but it is also due in part to the conviction which prevails that such structures must exist.

A distinct proof to this effect has been afforded by the researches of Heidenhain, on the effect of atropia upon the secretion of the submaxillary gland.

When one of the nerves going to this gland (viz. the chorda tympani) is stimulated, two effects usually follow :—First, the vessels going to the gland dilate, the blood flows quickly through them, and a free supply of lymph is poured out into the lymph-spaces surrounding the gland; secondly, the cells of the gland absorb this lymph, convert it into saliva, and pour it out into the duct of the gland.

If the animal be partially poisoned with belladonna (or its active principle, atropia), or if atropia be injected into the

vessels of the gland itself so as to exert its poisonous action upon the branches of the chorda tympani ending in the gland, a very different result takes place.

When the nerve is then irritated the vessels dilate as before, the blood pours rapidly through them, but not a drop of saliva is secreted. That part of the chorda tympani which acts on the vessels has not been affected by the poison, but those fibres which go to the secreting cells and stimulate them to secrete have been paralysed by it.

It is obvious, however, that the salivary secretion is only exceptionally induced by direct irritation of the chorda tympani nerve, lying as this does far below the surface and well protected from external influences. Usually secretion is induced reflexly from the mucous membrane of the mouth or tongue, the impression made by sapid substances upon the sensory nerves of these parts being transmitted up to the brain and then reflected outwards along the chorda tympani to the gland.

There is, however, yet a third way in which secretion may be induced, and that a somewhat extraordinary one, viz. by paralysis of certain nerves going to the gland instead of by irritation. What the cause of this secretion is has not been clearly made out, but the secretion itself is distinguished by its profusion and long continuance. It has not yet been ascertained whether this kind of secretion is arrested by atropia or not. We propose to ascertain this in future experiments; but as the question did not lie directly within the limits of our present investigation (although closely connected with it), we have not as yet attempted to solve it. There are, then, three ways in which secretion may be induced in the salivary glands:—1st, by direct irritation of the secreting nerves; 2nd, by reflex irritation of these nerves; and 3rd, by paralysis of nerves.

We have entered thus fully on the physiology of secretion in the submaxillary gland, because in it alone has the secreting process and the action of nerves upon it been at all fully studied.

Regarding secretion in the intestines very little is known, but it is probable that the process is performed in much the same way as in the salivary glands.

The reasons for this belief are as follows:—

1st. When the process of digestion is going on and the food

is present in the intestines, their vessels are fuller than at other times, just as they are in the salivary glands.

2nd. Stimulation of the mucous surface of the intestine induces secretion of intestinal juice, just as stimulation of the mucous membrane of the mouth induces a flow of saliva.

3rd. Section of all the nerves going to the intestine produces a profuse secretion of intestinal juice, which at once reminds us of the paralytic secretion observed in the submaxillary gland after section of its nerves.

This secretion of the intestine was first discovered by Moreau, who isolated a loop of intestine by means of ligatures, and then divided all the nerves passing to it on their course along the mesentery. On examining the intestine after four hours, the loop which had previously been empty was discovered to be filled with fluid.

This fluid was investigated chemically by Professor Kühne, now of Heidelberg, who found it to be neither more nor less than very dilute intestinal juice and almost identical in composition with the rice-water fluid which is poured from the intestines so abundantly in cholera (Kühne and Parkes).

The intestinal secretion can therefore be excited like the salivary one :—1st, reflexly by stimulation of the mucous membrane of the intestine; and 2nd, by division and consequent paralysis of all the nerves passing to the intestines.

Unlike the salivary secretion, however, it has not yet been induced by direct stimulation of the secreting nerves; and, indeed, these nerves are not yet known. It is not improbable, however, that they are extremely short, and are situated in the walls of the intestine itself, in which, indeed, the whole apparatus necessary to secretion would appear to be contained. This consists of the secreting glands, vessels, and nerves. The nerves immediately inducing secretion are probably the ganglia contained in Meissner's plexus, the short afferent fibres passing to these from the intestinal mucous membrane, and the short secreting fibres passing from them to the intestinal glands.

The stimuli which excite secretion, when applied to the intestinal mucous membrane, are of various sorts.

Mechanical stimulation, such as tickling the surface of the mucous membranes, at once excites it. The application of

dilute hydrochloric acid and induced electrical shocks have a similar effect. Sulphate of magnesia and other purgatives, however, instead of exciting secretion at once, do so only after an interval; and for some time it was supposed that they did not excite secretion at all. The experiments of Moreau, in which he injected magnesium sulphate into a loop of intestine and left it there for four hours, showed that the failure of previous experiments was due to their having applied it to the intestine for too short a time. These experiments were repeated by Vulpian, and also by Brunton, with similar results.

Your Committee, starting from the facts we have briefly enumerated, endeavoured to ascertain, first, whether other neutral salts have a similar effect to magnesium sulphate on intestinal secretion; secondly, whether any other compounds have the power of preventing such action; and thirdly, what are the nerves which regulate this secretion during life.

Series I. Action of other neutral salts on intestinal secretion. The method adopted in each case was as follows:—

A cat was chloroformed and an opening was made through the abdominal wall in the middle line. A coil of small intestine was then drawn out through the opening, and four ligatures were tied round it at a distance of ten centimetres (four inches) from each other, so as to isolate three pieces of intestine from each other and from the remainder of the intestinal tube. The measured quantity of solution was then injected into the middle loop, either by a very fine Wood's syringe, when the fluid was quite clear, or by making a puncture in the middle loop close to one end, inserting the nozzle of a syringe, and then after the injection of the fluid tying another ligature round the intestine close to the wound so as to prevent the exit of any fluid. This proceeding hardly diminished the length of the loop by more than three millimetres (one-eighth of an inch).

The intestine was then returned to the abdominal cavity, the wound sewn up, and the animal allowed to recover. After about four hours it was killed by a blow on the head with a hammer; the abdominal cavity was opened and the intestine examined.

Experiments were made with potassium acetate, chlorate, ferrocyanide, iodide, sulphate, neutral tartrate, with sodium

acetate, bicarbonate, chloride, phosphate, and sulphate, as well as with tartrate of potash and soda. [For particulars see Series I. and Table I. in Appendix.]

From these it appears that several of the other neutral salts possess a similar action to that of magnesium sulphate, though none are so constant or so marked in their action.

The amount of secretion obtained from similar pieces of intestine with similar quantities of the salts differed considerably in different experiments. The cause of this we have not yet determined. It is not improbable that it depends to some extent on the stage of digestion when the injection was made; but this we propose to ascertain hereafter.

SERIES II. We next tested the effect of various drugs in preventing this action of neutral salts, and for this purpose took a saturated solution of magnesium sulphate as that of which the action is the most constant yet ascertained.

In some cases we mixed the modifying agent with the magnesium sulphate in order to obtain the local action of the drug on the mucous membrane, in others it was introduced into the circulation by subcutaneous injection so as to obtain its general action on the nervous system. The drugs tested in the former way were:—

Gramme.	
·32	sulphate of atropia.
·32	iodide of methyl-atropia.
·32	chloral hydrate.
·064	emetia.
·13	morphia.
·32	sulphate of quinine.
·32	tannin.
·064	sulphate of zinc.

Those introduced by subcutaneous injection were,

1 gramme	chloral	Used in cholera by Dr. Hall of Bengal.
·19	do.	
·064	acetate of morphia.	

In none of these experiments was there any effect of the above drugs in diminishing the average amount of secretion

produced by magnesium sulphate. There appears, therefore to be no action analogous to that of atropia upon secretion of the submaxillary gland. [For summary see Table II. in Appendix.]

Direct ligature of the mesenteric veins produced profuse hæmorrhage into the loop of intestine, without any apparent secretion.

SERIES III. The last point we proposed to investigate was the precise manner in which the nervous system influences secretion.

We first repeated Moreau's experiment by dividing the filaments of nerve in the mesentery which passed to a ligatured loop of intestine. In two cases we obtained a negative result, owing probably to some of the smaller fibres having escaped; but in the third a more successful division was followed by profuse secretion into the loop. This, therefore, is an effect common to cats as well as to dogs and rabbits.

We next divided both splanchnic nerves below the diaphragm; and as this produced no abnormal result on the intestine, we determined to excise the semilunar ganglia (dividing the splanchnics in the same operation).

In 18 experiments we only once found any considerable secretion in the loop of intestine.

The results on the vascularity of the intestines, their peristaltic movements and tonic contraction, are given in detail in the Appendix, Series III.

It would appear from these experiments that the splanchnic nerves are not the channel by which currents from the cord pass to the secretory apparatus of the intestine.

What this channel is, we hope to ascertain by further investigation, which we intend to apply not only to the secretion, but also to the movements of the intestinal tube.

APPENDIX

Series I.

Experiment 1.—Saturated solution of magnesium sulphate. Three loops were isolated, and $2\frac{1}{2}$ c. c. injected into the middle loop.

On examination,

Middle loop contained 8·5 c. c. of opalescent fluid, which gave an abundant precipitate with HNO_3.

Upper loop } empty.
Lower „ }

Mucous membrane pale in all loops.

Experiment 2.—Saturated solution of potassium acetate. 5 c. c. were injected into the middle loop.

On examination,

Middle loop contained 8 c. c. blood-stained turbid fluid with very little mucus,
= 7·5 c. c. after filtration. Precipitated by HNO_3.

Upper.................... 8 c. c. yellow and turbid,
= 5 c. c. after filtration. Not changed by the addition of HNO_3.

Lower............. = 5·5 c. c.,
3·5 c. c. after filtration. Precipitated by HNO_3.

Mucous membrane :—

Middle loop pale, covered with tenacious mucus; serous coat greatly injected.

Upper „ pale.

Lower „ pale, covered with mucus.

Experiment 3.—Saturated solution of potassium acetate. $2\frac{1}{2}$ c. c. were injected into the middle loop. Weight of cat $2\frac{3}{4}$ lbs.

On examination,

Middle loop contained 15·5 c. c. of turbid fluid.

Upper „ empty.

Lower „ about 1 c. c. of mucus.

Mucous membrane :—

Middle loop slightly congested, covered with flakes of mucus. The mucous membrane appeared very thin.

Upper ,, normal; bile stained.

Lower ,, soft, moist, covered with mucus.

Experiment 4.—Saturated solution of potassium chlorate. Into the middle loop 2½ c. c. were injected.

On examination,

Middle loop } each contained 13 c. c. of a fluid resembling
Lower ,, } white of egg, both in colour and consistency.

Upper ,, empty.

Mucous membrane :—

Middle loop } normal in colour; soft.
Lower ,, }

Upper ,, moist, covered with bile-stained matter.

The fluid from the middle and lower loops was not coagulated by heat. It was rendered turbid by HNO_3, and slightly so by acetic acid.

Experiment 5.—Saturated solution of potassium chlorate. Weight of cat 3 lbs. 2½ c. c. of the saturated solution were injected into the middle loop.

On examination,

Middle loop contained 9 c. c. of a grey muddy fluid.

Upper ,, ,, ½ c. c.

Lower ,, ,, ½ c. c.

Mucous membrane :—

Middle loop pale, moist.

Upper ,, do.

Lower ,, do.

Experiment 6.—Saturated solution of potassium ferrocyanide. Three loops were isolated as before; into the middle one 2½ c. c were injected.

On examination,

Middle loop contained a small quantity of fluid, probably about 5 c. c.; but as the intestine was punctured in opening the abdomen and some of the fluid escaped, it

could not be exactly measured, and was estimated approximately. Other loops empty.

Experiment 7.—Saturated solution of potassium ferrocyanide. $2\frac{1}{2}$ c. c. were injected into the middle loop. The cat escaped, and twenty-two hours after was found dead. Weight of cat 3 lbs.

On examination,

Middle loop contained 5·5 c. c. of a purulent-looking fluid.

Upper „ „ 3 c. c. of do. do.

Lower „ empty.

Mucous membrane :—

Middle loop. All the coats deeply congested.

Upper „ } pale.
Lower „ }

Experiment 8.—Saturated solution of potassium ferrocyanide. $2\frac{1}{2}$ c. c. injected into middle loop.

On examination,

Middle loop contained 13 c. c.

Upper „ „ 10 c. c.

Lower „ empty.

The fluid gave no colour with perchloride of iron.

Mucous membrane :—

Middle loop moist, pale.

Upper „ dry, pale.

Lower „ moist ; contained a little moist fæcal matter.

Experiment 9.—Saturated solution of potassium iodide. $2\frac{1}{2}$ c. c. injected into middle loop. After tying the ligatures round the intestine, it contracted to the thickness of a pencil. Weight of cat 6 lbs.

On examination,

Middle loop empty; has a hole in it.

Upper „ } both contained about 3 c. c. of fluid.
Lower „ }

Mucous membrane :—

Middle loop. Part of this loop seems to have been eroded by the potasium iodide, causing the formation of a hole in the intestine. The mucous

membrane is congested and partly covered with bloody mucus.

Upper „ } pale; normal.
Lower „ }

Experiment 10.—Almost (but not quite) saturated solution of potassium iodide. 5 c. c. injected into the middle loop.

On examination,

Middle loop empty; contained no liquid.

Upper „ } empty.
Lower „ }

Serous coat of middle loop deeply congested and bright red all over.

Upper loop } normal.
Lower „ }

Mucous membrane :—

Middle loop normal, but the deep injection of the submucous coat shines through it.

Upper „ } normal.
Lower „ }

Experiment 11.—Nearly saturated solution of potassium iodide. 1 c. c. was injected into the middle loop, and by gentle pressure was brought into contact with the whole of its surface.

On examination,

Middle loop contained 8 c. c.

Upper „ } empty.
Lower „ }

Mucous membrane :—

Middle loop congested.

Upper „ } normal, dry.
Lower „ }

Experiment 12.—Saturated solution of potassium sulphate. 5 c. c. injected into middle loop.

On examination,

Middle loop contained 14 c. c., which after filtration = 9 c. c.

Upper „ „ 3 c. c.

Lower „ „ 3 c. c.

Mucous membrane :—

Middle loop moist, not congested.

Upper „ } normal.
Lower „ }

Experiment 13.—Saturated solution of potassium sulphate $2\frac{1}{2}$ c. c. injected into middle loop. Weight of cat $4\frac{1}{2}$ lbs.

On examination,

Middle loop contained 9 c. c. of turbid fluid, with many flakes of thick mucus.

Upper „ } empty.
Lower „ }

Mucous membrane :—

Middle loop faintly congested, covered with soft flakes of white mucus.

Upper „ normal, dry.
Lower „ do. do.

Experiment 14.—Saturated solution of potassium sulphate. 5 c. c. injected into the middle loop.

On examination,

Middle loop contained 14 c. c., which after filtration = 9 c. c.

Upper „ „ 3 c. c.
Lower „ „ 3 c. c.

Mucous membrane :—

Middle loop moist, not injected.

Upper „ } normal.
Lower „ }

Experiment 15.—Saturated solution of potassium tartrate. $2\frac{1}{2}$ c. c. were injected into the middle loop.

On examination,

Middle loop contained 7 c. c. of fluid, which after filtration $= 2\frac{1}{2}$ c. c.

Upper „ } empty
Lower „ }

Experiment 16.—Saturated solution of sodium acetate. $2\frac{1}{2}$ c. c. were injected into the middle loop. Weight of cat $6\frac{1}{2}$ lbs.

On examination,

Middle loop, 10 c. c.

Upper loop 9 c. c.
Lower „ empty.

Mucous membrane :—

Middle loop congested, covered with soft mucus.
Upper „ pale, covered with soft mucus.
Lower „ covered with bile-stained matter.

Experiment 17.—Saturated solution of sodium acetate. 5 c. c. injected into middle loop.

On examination,

Middle loop contained 10 c. c. of fluid, after filtering = 5 c. c.
Upper „ } empty.
Lower „ }

Mucous membrane :—

Middle loop soft, surface exceedingly so.
Upper „ } natural
Lower „ }

Experiment 18.—Saturated solution of sodium bicarbonate. 5 c. c. of the solution injected into the middle loop.

On examination,

Middle loop contained a tapeworm and some fluid.
The worm, mucus, and fluid were = 15 c. c.
After filtration, the fluid only . . = 6·5 c. c.
Upper „ contained a worm and fluid . . . . . . = 8 c. c.
After filtering . . . . = 6 c. c.
Lower „ empty.

Mucous membrane :—

Middle loop much congested.
Upper „ much thickened, not congested.
Lower „ natural.

Experiment 19.—Saturated solution of sodium chloride. 5 c. c. of the solution were injected into the middle loop.

On examination four hours after,

Middle (injected) loop contained 10·25 c. c. fluid.
Of this about one-third appeared to be thick mucus.
Upper loop } completely empty.
Lower „ }

Mucous membrane :—

Middle loop much thickened and congested.

Upper „ } natural.
Lower „ }

Experiment 20.—Saturated solution of sodium phosphate. $2\frac{1}{2}$ c. c. were injected into the middle loop. The omentum stuck in the wound in the abdominal walls and was caught in the stitches and attached to the wound while it was being sewn up. Weight of cat $4\frac{1}{4}$ lbs.

On examination,

Middle loop contained soft fæces. No fluid.

Upper „ } dry.
Lower „ }

The whole intestine was pale.

Middle loop }
Upper „ } not congested.
Lower „ }

Experiment 21.—Saturated solution of sodium phosphate. 5 c. c. injected into middle loop.

On examination,

Middle loop contained 11 c. c. blood-stained fluid, which = 5·5 c. c. after filtering.

Upper „ empty.

Lower „ 7·5 c. c., = 4 c. c. after filtering.

Mucous membrane :—

Middle loop much congested.

Upper „ natural; contains a little blood slightly altered.

Lower „ soft, not congested.

Experiment 22.—Saturated solution of sodium sulphate. $2\frac{1}{2}$ c. c. were injected into the middle loop. Weight of cat 3 lbs.

On examination,

Middle loop contained 18 c. c. of a milky fluid.

Upper „ „ 5 c. c.

Lower „ „ 3 c. c.

Mucous membrane :—

Middle loop slightly congested, soft, moist.

Upper „ pale, moist.

Lower „ do. do.

Experiment 23.—Saturated solution of sodium sulphate. 5 c. c. injected into middle loop.

On examination,

Middle loop contained 9 c. c., after filtering = 7 c. c.

Upper ,, }
Lower ,, } empty.

Mucous membrane :—

Middle loop, soft, but not at all congested.

Upper ,, }
Lower ,, } natural.

Experiment 24.—Saturated solution of sodium tartrate. 5 c. c. injected into middle loop.

Middle loop contained 11 c. c. blood-stained fluid, after filtering = 7·5 c. c.

Upper ,, }
Lower ,, } empty.

Mucous membrane :—

Middle loop slightly congested and soft.

Upper ,, }
Lower ,, } natural; covered with a layer of black fæcal matter.

Experiment 25.—Saturated solution of sodium and potassium tartrate. $2\frac{1}{2}$ c. c. were injected into the middle loop. Weight of cat $4\frac{1}{2}$ lbs. The wound was sewn up as usual, but the sutures gave way, and the intestines protruded for some time before examination.

On examination,

Middle loop contained 16 c. c. of fluid mixed with flakes of soft mucus and small coagula of blood.

Upper ,, }
Lower ,, } each contained about $\frac{1}{2}$ c. c. of soft glairy fluid.

Mucous membrane :—

Middle loop }
Upper ,, }
Lower ,, } congested.

TABLE I. *Exhibiting the Results of the Twenty-five Experiments above described.*

Salt injected.	Quantity.	Fluid found in Middle Loop.
Magnesium sulphate	2·5 c. c.	8·5 c. c. opalescent, albuminous.
Potassium acetate	5 ,,	7·5 ,, blood-stained, turbid, albuminous.
Ditto	2·5 ,,	15·5 ,, turbid.
Potassium chlorate	2·5 ,,	13 ,, glairy.
Ditto	2·5 ,,	9 ,, muddy.
Potassium ferrocyanide	2·5 ,,	5 ,, approximately.
Ditto	2·5 ,,	5·5 ,, puriform.
Ditto	2·5 ,,	13 ,,
Potassium iodide	2·5 ,,	intestine corroded.
Ditto	5 ,,	empty.
Ditto	1 ,,	8 ,,
Potassium sulphate	5 ,,	9 ,, after filtration.
Ditto	2·5 ,,	9 ,, turbid.
Ditto	5 ,,	9 ,, after filtration.
Potassium tartrate	2·5 ,,	2·5 ,, after filtration.
Sodium acetate	2·5 ,,	10 ,,
Ditto	5 ,,	5 ,, after filtration.
Sodium bicarbonate	5 ,,	6·5 ,, ditto worm present.
Sodium chloride	5 ,,	10·2 ,, ditto about ⅓ mucus.
Sodium phosphate	2·5 ,,	no fluid.
Ditto	5 ,,	5·5 ,, blood-stained.
Sodium sulphate	2·5 ,,	18 ,, milky.
Ditto	5 ,,	7 ,,
Sodium tartrate	5 ,,	7·5 ,, blood-stained.
Sodium and potassium tartrate	2·5 ,,	16 ,, mucus and blood.

SERIES II.

Experiment 26.—Sulphate of atropia. 2½ c. c. saturated solution of magnesium sulphate mixed with 5 grains of sulphate of atropia were injected into middle loop.

On examination,

Middle loop contained 15·5 c. c. turbid and blood-stained fluid, = 8·5 c. c. after filtration.

Upper ,, } empty.
Lower ,, }

Mucous membrane:—

Middle loop injected, minute points of ecchymosis.

Upper ,, } pale.
Lower ,, }

Experiment 27.—Iodide of methyl atropia. 2½ c. c. saturated

solution of magnesium sulphate containing five grains of iodide of methyl-atropia injected into middle loop.

On examination,

Middle loop contained 6 c. c. opalescent fluid, = 4·5 c. c. after filtration. It gave a copious precipitate with HNO_3.

Upper ,, } empty.
Lower ,, }

Mucous membrane :—

Middle loop injected, with minute ecchymosis, and covered with tenacious mucus.

Upper ,, } pale.
Lower ,, }

Experiment 28.—Chloral hydrate. $2\frac{1}{2}$ c. c. saturated solution of magnesium sulphate containing 5 grs. of chloral hydrate were injected into the middle loop.

On examination,

Middle loop contained 10 c. c. slightly blood-stained fluid, = 9 c. c. after filtration.

Upper ,, } empty.
Lower ,, }

Mucous membrane :—

Middle loop pale.

Upper ,, } pale also.
Lower ,, }

Experiment 29.—Emetia. $2\frac{1}{2}$ c. c. saturated solution of magnesium sulphate with 1 grain of emetia injected into the middle loop.

On examination,

Middle loop contained 12·5 c. c. blood-stained fluid mixed with mucus, = 10 c. c. after filtration. It gave a dense precipitate with HNO_3.

Upper ,, } empty.
Lower ,, }

Mucous membrane :—

Middle loop injected, with minute ecchymosis, covered with thick yellow mucus.

Upper ,, } pale.
Lower ,, }

Experiment 30.—Morphia. $2\frac{1}{2}$ c. c. saturated solution of magnesium sulphate containing 2 grains of morphia were injected into the middle loop.

On examination,

Middle loop contained 7·5 c. c. of clear fluid, with a little mucus; after filtration = 6·5 c. c. It gave no precipitate with HNO_3.

Upper „ } empty.
Lower „ }

Mucous membrane :—

Middle loop slightly injected and covered with thin mucus.

Upper „ } pale.
Lower „ }

Experiment 31.—Sulphate of quinine. $2\frac{1}{2}$ c. c. saturated solution of magnesium sulphate containing 5 grains of sulphate of quinine were injected into the middle loop.

On examination,

Middle loop contained 19 c. c. of turbid fluid and thick mucus. After filtration it was = 7 c. c., and opalescent. It gave a copious precipitate with HNO_3.

Upper „ empty.

Lower „ contained a very little fluid.

Mucous membrane :—

Middle loop slightly injected, covered with gelatinous mucus.

Upper „ } pale.
Lower „ }

(To be continued.)

TUBERCULAR MENINGITIS TREATED WITH FREE PHOSPHORUS.[1]

BY W. E. GREEN, M.R.C.S. ENG., L.S.A.

Surgeon to the Isle of Wight and Newport Railway Companies.

I FIRST saw Mrs. B—— on May 19th, 1884, and found her complaining of sore throat, which had commenced about two months previously. At first this amounted only to discomfort in swallowing, but was now a constant trouble to her. On examination the larynx and pharynx were found to be a good deal congested, but there was no granular condition of the parts. She had never been strong, but there was no history of consumption in her family.

She was delicate in appearance, with one child of two years, and she was shortly expecting another.

There was complete loss of appetite, and she had lately lost flesh, but there was no rise in temperature. A tonic was prescribed, but the symptoms continued unabated; local applications were used, but without benefit. Soon a constant rise in temperature to about 101° was noted, and she still lost flesh continually. The pain became referred more to the larynx, and was always greatest upon movement of that organ, as in deglutition. Laryngeal phthisis was diagnosed both by my partner and myself.

The child was born on May 30th, but the throat symptoms and rise in temperature continued as before.

There was no return of appetite, and now a constant dry cough was added to the other symptoms.

She sat up for the first time on June 14th, and came down stairs on the 16th. On the 17th I saw her, and found all the symptoms increasing.

Early on *June 23rd* I received an urgent summons to see her, and was told that she was delirious, that she had at times been noticed to say and do stupid things during the previous week

[1] Read at the October Meeting of the Isle of Wight District Branch of the British Medical Association.

but that on the 22nd she had become delirious, with occasional lucid intervals.

At my visit I found her in a condition of low, muttering delirium, from which she was partially roused by speaking loudly, but it was doubtful if she recognised me. No food or drink had been swallowed for some hours, and the pulse indicated a weak and exhausted condition. The pupils were unequally dilated, and acted very imperfectly to the stimulus of light. The pulse was slow and weak, the temperature 100°·4, and the cerebral maculæ were well marked.

Considering this to be a case of tubercular meningitis, a most unfavourable prognosis was given, but she was ordered to have good beef-tea and milk at frequent intervals, and to take gr. $\frac{1}{16}$ of free phosphorus in oil every four hours. This remedy was selected because I had lately read a report on some cases of tubercular meningitis in children successfully treated by a French syrup containing this agent, and was therefore hopeful that it might be useful in this case.

June 24th.—On calling this morning I am told that she is worse, that she has taken no medicine, or milk or other nourishment, all attempts at giving them having failed, the fluid being allowed to run out of the mouth instead of being swallowed.

The temperature was normal, but all the other symptoms were exaggerated.

Calling for the medicine, and placing the patient on her back, I gave a dose at once, following this up with half a pint of beef-tea and milk mixed, which the patient was compelled to swallow a mouthful at a time. The friends seeing the possibility of feeding her promised to do so every four hours, and my evening report stated that this had been done.

June 25th.—There had been less excitement, but all the other symptoms remained as before, except that the secretions were now passed unconsciously. Everything had been given as directed, and the friends said that she was less restless for a time after each administration of food and medicine.

June 26th.—Less restless, and now taking everything without resistance. The delirium is not so constant, but she is very weak.

June 27th.—Continues as yesterday. On the evening

of this day I left home for ten days, leaving her in charge of my partner.

June 29th.—The symptoms continued as at my last visit, but Dr. Barker thought her so weak, that he told the friends she might die at any time.

Treatment continued.

June 30th.—Patient quieter, is sleeping well, and appears somewhat better. On the evening of this day she suddenly awoke to consciousness, and asked how long she had been ill. From this time she improved in many ways, took nourishment well, and when seen on my return, was apparently in the same condition of health as before the meningitis came on; the pulse was stronger, and the temperature normal. This condition however was not lasting, the temperature again rose, the laryngeal symptoms continued, and the patient gradually sank exhausted, dying of acute tuberculosis on August 25th.

After the patient's return to consciousness, she was unable to take the phosphorised oil, and once again later when given in a pill it produced nausea and retching, and had to be discontinued.

These, gentlemen, are the Notes of this case which I thought might be of interest to you, and which I would conclude with a transcript of the remarks made by Dr. Thorowgood in a communication to the *British Medical Journal* for June 21st.[1]

He says, "I can quite understand the remarkable success that has attended Dr. Greenway's treatment of tubercular meningitis by phosphorus. Phosphorus is a nutrient for exhausted nerve-substance, and it certainly is a powerful absorbent of recent exudations. Phosphorated oil has been said to promote the absorption of a cataract if it be rubbed over the eyebrow. In meningitis, we have exudation of yellow lymph about the base of the brain, beneath the arachnoid, and in the web of the pia mater. Prior to absorption, lymph undergoes a fatty transformation or solution, and this condition is speedily brought about by phosphorus, for the drug is well known speedily to induce fatty change in organs. Pathological knowledge appears, therefore, to point to the fitting medicine."

[1] The baby died on the 28th of October, from tuberculosis, after some weeks' suffering. The disease in this case commenced in the left axillary glands, afterwards spreading to other glands, and causing death from exhaustion.

Reviews.

Lectures on Mental Diseases. By W. H. O. SANKEY, M.D., Lond. 2nd Edition. London: H. K. Lewis. 1884.

DR. SANKEY has placed in the hands of medical men a most useful and readable work. The feature of his lectures which is most deserving of commendation, is his successful endeavour to bring into a focus the great variety of artificially differentiated forms of mental disease. Recent writers have been too much addicted to compiling tables of varieties of insanity, differentiated only by some minute point in causation or symptomatology. Dr. Sankey proceeds in a much more scientific manner by basing his classification on the existence of essential features of resemblance, and thus reduces the maladies with which he has to deal to a small and well-defined group. The ground on which he considers that classification should rest is "some essential character of the morbid process present in its entirety," not, as he explains, upon any particular phase through which a certain case may pass. In this manner Dr. Sankey arrives at the formation of a table resembling that of the Paris International Congress of Alienists held in 1867. Under ordinary insanity he includes mania, melancholia, and monomania. Along with ordinary insanity Dr. Sankey ranks in the group of idiopathic forms general paresis, idiocy, and senility. This symptomatic group includes epileptic insanity, alcoholism, spinal diseases, and organic cases. The method which thus sees unity in diversity is practically more useful and philosophically more correct. The author describes the etiology, morbid anatomy, and pathology of mental diseases in the manner of one whom prolonged experience has saturated with his subject. He describes fully the phenomena of the preliminary stages of mental diseases, and his contrast of the initiatory symptoms of ordinary insanity with those of general paresis is full and strikingly antithetic. This precision in dealing with the early stages is specially commendable, inasmuch as the detection of the beginnings of mental disease rests, in most instances, with the general practitioner and not with the specialist. Most medical men have a certain amount of difficulty

in formulating and expressing in the shape of a medical certificate the evidence upon which they base their decision that a person is insane. To feel certain that one is insane and to analyse his mental condition, and to formulate the grounds on which this certainty is based, are totally different things. Dr. Sankey provides us with a *memoria technica*, which makes it easy to trace step by step such modifications in the mind of the insane person as would amount to clear evidence of insanity. The steps are, changes in, M, manner, E, emotional feelings, as affection, &c., T, temper, H, habit, O, or, D, in disposition, I, ideas or intellect, C, character. At a more advanced stage the addition of marked delusions or hallucinations should simplify the task of certification.

Dr. Sankey prepares the way for the consideration of the practical part of his subject by a scholarly analysis of the constitution of the mind; and more particularly on the vexed question of volition he expresses himself clearly and convincingly. When, subsequently, he has to deal with the medico-legal side of insanity he makes excellent use of this preliminary analysis.

Where, in various parts of his work, Dr. Sankey deals with matters relating to the custody of the insane, it may be thought by many that he under-estimates the disadvantages of incarceration in asylums. He has a good deal to say about the "local reminders of supposed grievances" as a reason why an insane person should be removed from home. At the same time he admits that it is generally the *supposed* grievances, and not any remediable real grievance which constitute "either the remote or the proximate cause of the attack." Some might be inclined to think that Dr. Sankey under-estimates the number of local reminders of supposed grievances which exist in asylums, where a patient must suffer from association with companions who are much given to talking about similar fictitious grievances. The author's mental attitude on this subject may perhaps be judged by the final paragraph of his work. "There are," he says, "two provisions in the Statutes which ought to remove the apprehensions which sensational writers have formed and fostered; by special clauses in the various Acts any patient who has been in any asylum at any period within five years may voluntarily return for treatment without the preliminary forms described. This privilege is occasionally claimed. The other is that by special permission of the Commissioners a friend or relation, as a wife or sister, may take up residence in a private asylum with the patient; this privilege is more frequently resorted to." Seeing that those who consider removal to and detention in asylums as too readily effected, are generally solicitous about persons who are quite the opposite of voluntary patients, and

whose friends and relatives are not at all likely to share their captivity with them, these statutory amenities are not likely to satisfy them whether they are sensational or even logical writers.

These are matters, however, which have no direct bearing on the value of these lectures. As a handy treatise on the essential features and on the scientific and social relationships of mental disease Dr. Sankey's work has few equals in English.

Dental Caries: a Critical Summary; and the Prevention of Dental Caries. By HENRY SEWILL, M.R.C.S., and L.D.S. Eng. 8vo, pp. 66. London: Baillière, Tindall, and Cox. 1884.

THE first part of this work gives a very clear account of our present knowledge of the ætiology and pathology of dental caries, and the most important facts upon which that knowledge is based. The author lays no claim to be an investigator. By critically summarising the various views that have been put forward as to this disease, he endeavours to deal a death-blow to an old notion which has recently been brought rather prominently forward, namely, that enamel and dentine are capable of inflammation, and the dental tissues of undergoing retrograde metamorphoses, and that the influence of "vital force" or of "diminished vitality" should be numbered among the predisposing causes of caries. He defines caries as a process of disintegration, commencing invariably at the surface, proceeding inwards, and due entirely to external agents, enamel and dentine being perfectly passive under this process of disintegration, and manifesting neither pathological action nor vital reaction of any kind. His first argument is that the anatomical characters of enamel and dentine are such as to preclude the possibility of these tissues undergoing a process of inflammation and pathological change. He bases his opinions upon the researches and well-known works of Wedl, and John and Charles S. Tomes. The recent investigations of Messrs. Underwood and Mills in this country, and of Dr. Miller in Berlin as to the behaviour of the micro-organisms (consisting of micrococci, rod-shaped and oval bacteria and short bacilli) which are invariably present in carious dentine, are also largely quoted in support of his views. Though the exact part which these micro-organisms play in the process of caries is not yet thoroughly made out, still it is probable that in their absence caries would not go on.

The facts established by these and other investigators seem to prove that the "appearances in carious dental tissues are all interpretable, and solely and exclusively interpretable, as changes due to disintegration unaccompanied by vital reaction of any kind." The author also relies upon the fact "that caries

of dead teeth retained in the mouth is identical in all its objective phenomena with the disease in living teeth," as establishing the truth of his definition of caries.

In the second paper—on the prevention of dental caries—he recommends that an attempt should be made by diet and therapeutics to supply the developing tissues of poorly-formed teeth with the mineral constituents of which they stand in need.

With a view of checking the formation of acid in the mouth he recommends strongly the removal of all organic debris by means of the tooth-brush, tooth-pick, and floss silk passed between the teeth, together with the use of a carbolic acid tooth-powder and an antiseptic mouth-wash.

He enforces the opinion, in which we heartily agree, that in fevers and other diseases where the patient is too feeble or too listless to clean his teeth for himself it should be done by an attendant. In such cases he recommends the mouth to be thoroughly rinsed with a mouth-wash consisting of a solution of perchloride of mercury (one grain to the ounce) in eau-de-Cologne or tincture of lemons, a grain of chloride of ammonium being added to prevent the decomposition of the perchloride. A teaspoonful of the mixture is to be added to two-thirds of a wine-glass of water. He also advocates the increased use of the teeth in mastication as conducive to the health of the teeth.

The views of the author are stated with considerable clearness and much force, and, as they are now accepted by the majority of those who have studied the subject, his statement should disabuse those who think that dental caries once established can be influenced by therapeutic agents acting upon the dental tissues from within. The *rationale* of preventive treatment, and the limits of possible treatment of developing teeth, are very clearly set forth, and should prove alike useful to the medical and the dental practitioner.

Clinic of the Month.

Biskra Button.—Some interesting observations with regard to the contagious pustule known as "Biskra button" have lately been recorded by MM. Duclaux and Fournier. The subject of the disease was a man who had come from Tunis. Examination of his blood and of fluids from the thickened tissues near the seat of disease showed the presence of a form of micrococcus. When this was cultivated in veal-decoction and some of the latter injected subcutaneously into a rabbit, a gangrenous patch of the characteristic Biskra type formed at the wound, while secondary abscesses containing the same germs as the parent lesion developed in its neighbourhood. It was also noticed that the virus when cultivated in sterilised meat infusion gradually decreased in potency, and at last became inactive. This may have been because the pabulum was exhausted, for the addition of fresh meat-infusion restored the former septic properties. The results of one such investigation would hardly justify a generalisation as to cause and effect in this disease, were it not that a further examination of sixty similar cases with inoculations of their associated micrococci in various animals by MM. Deperet and Boisset (*Lyon Médical*) bears testimony in the same direction. In this latter group of observations, hereditary transmission of the pustule was proved in the case of a bitch affected with Biskra button, which became pregnant and gave birth to puppies diseased in the same way. (*Progrès Médical*, June 14 and 21, 1884.)

Phosphated Peptone.—The benefit gained by the use of phosphate of calcium in scrofula is well known. Dr. A. Judet warmly praises its utility for persons of this diathesis, during pregnancy and lactation. At such times its bone-forming properties and its influence on the assimilation of albuminoids render it equally helpful to mother and child. Dr. Judet has lately used this preparation in combination with peptone as found in the *Vin de Bayard* to correct severe vomiting in a feeble woman three months pregnant. After slight initial intolerance, a tablespoonful every four hours was well borne, and the amount gradually increased to twice that quantity, no other food being given

Distressing symptoms soon ceased, and after a time soups and other light forms of food could be taken. A small quantity of the phosphated peptone continued to be used throughout the time of pregnancy and lactation. A large and healthy child was born, and the mother was able to suckle it herself, a task to which her strength had not been equal in the case of her previous children. (*Progrès Médical,* August 2, 1884.)

Rupture of the Sigmoid Flexure in New-born Children.—Zillner made post-mortem examinations of four children who had died, within twelve or fifteen hours, of peritonitis from rupture of the sigmoid flexure. These cases are interesting from a medico-legal point of view. It was questionable if the rupture was not produced by violence in giving enemata. It seems scarcely probable that any usual violence during delivery could have caused the accident. Zillner also offers the following explanation. During the labour the mother presses upon the abdomen of the child, thus fixing the sigmoid flexure, which is filled with meconium, or else drawing it down into the pelvis. Then comes a moment when the pressure on the abdomen is so strong that the sigmoid flexure comes between the lumbar vertebræ or the linea arcuata on one side, and the abdominal walls on the other, until it is compressed tightly and cannot move. The meconium can either slip away toward the descending colon, or into the rectum, slight pressure only being necessary to rupture the upper part of the flexure. Experiments seem to bear out this theory. (*Centralbl. f. klin. Med.,* July 5, 1884.)

Hæmorrhagic Purpura from Emotional Cause.—A well-nourished boy, aged sixteen, of good family and personal history, received a severe fright, and on the next day had to leave work from an attack of epistaxis, followed by general malaise, with pains in the limbs and joints. The next morning he was covered with red spots, but felt somewhat better, and again went to work. Epistaxis again occurred, and was followed later by copious hæmorrhages from the anus, urethra, conjunctiva, ears, and nose. On the fifth day of the attack he was admitted to the General Hospital in a state of profound exhaustion. He was covered with red patches of purpura, varying in size from a lentil to sixpence or a shilling. Hæmorrhage from the mucous surfaces still continued, and the urine and stools were full of blood. Under a simple diet—with sulphuric lemonade, ergot, and perchloride of iron—he made a good and rapid recovery. (*London Medical Record,* August 1884.)

The Nature of Purpura.—In a contribution to the study of purpura (*Annales de Derm. et de Syph.,* January 1884) M. Leloir says

that the pathogenesis of purpura is still surrounded by great obscurity. Few cases are recorded in which the vascular lesions have been ascertained. The author gives two cases in full detail, the first being a good example of vascular purpura, the lesions of the cutaneous vessels found on post-mortem examination being an enormous dilatation of the vessels, and pronounced alterations of the vascular walls. In contrast with this case, in which the vascular origin appeared undeniable, he relates a second, in which no vascular lesion could be found, although there were numerous deep and extensive cutaneous hæmorrhages. Here the cause evidently was an alteration of the blood. But in the first case, with appreciable lesions of the capillary vessels, the hæmorrhages were small and limited; while in the second, with vessels apparently intact, the hæmorrhages were extensive and situated in the middle region of the dermis. Diapedesis does not seem sufficient to account for such pronounced hæmorrhages. In some part there must be vascular rupture. One may suppose (with Hayem) that in certain diseases the blood-plasma acquires the property of provoking concretions by precipitation, leading to multiple capillary embolisms, and thus causing purpura hæmorrhagica from hæmorrhagic infarcts. Certain forms of purpura of the lower extremities in cachectic subjects may be explained by stagnation of blood (often with œdema), and alteration of the blood; intravascular fibrinous coagulation, formation of embolic clots, hæmorrhagic infarcts, and cutaneous hæmorrhage. It is probable that many cases of purpura arise from alteration of the blood; perhaps even sometimes purpura *a frigore*, purpura of rheumatism, &c., arise from blood-dyscrasia leading to intravascular coagulation, clots by precipitation, or capillary embolisms. As to the nature of the alterations of the blood, many authors speak of the too great fluidity of the blood; but the quantity of fibrin, far from being diminished, is frequently increased in purpura. The author would group the pathogenic causes of purpura thus:—

A. Purpura from Modifications of the Vessels.—1. From perturbation of the capillary circulation, whatever its origin, leading to active or passive hyperæmia, producing hæmorrhage by diapedesis or by vascular rupture. 2. Purpura télangiectasique of Cornil. 3. Purpura from primary alteration of the vascular walls, and consecutive rupture of these walls.

B. Purpura from Modifications of the Blood.—1. Too great fluidity of the blood (? purpura by diapedesis). 2. From vascular obstructions determined by certain elements contained in the blood leading to the formation of thromboses and embolisms. This purpura might occur from simple diapedesis; it is more often hæmorrhagic infarction of the skin. *a.* From formation of clots in blood-dyscrasiæ. *b.* From embolism formed by white corpuscles (leucocythæmia, &c.). *c.* From embolisms formed by

bacteria or micrococci (septic diseases, &c.). *d.* From embolisms formed by altered blood-elements (?).

C. Purpura Nervosa.—In practice, however, many cases will not fall completely into either group; very often the origin seems to be complex. Alteration of the blood, troubles of the circulation, vascular lesions, disturbances of innervation, all causes of cutaneous hæmorrhage, may coexist in the same subject. In all probability, even dyscrasic purpura may be in certain cases the origin of secondary vascular lesions, of secondary endarteritis. And it is probable that alteration of the blood often modifies the action of the vaso-motor nervous apparatus, central or peripheral. In studying a case of purpura, it must not be forgotten, then, that its pathogenesis may be complex. The relative importance of the different causes must be sought; and an attempt must be made to determine the relations between the determining primary or predisposing causes and the occasional or secondary causes. (*London Medical Record,* August 1884.)

Treatment of Fractured Patella.—Dr. Van der Meulen notes that, in the space between the two fragments of a broken patella, a clot of blood is formed. This clot is not organised at once in its entirety, but the anterior and posterior surfaces are first organised, and only after some time does the process involve the central portion. In this way the two fragments come to be united by two thin pseudo-membranes. The author takes advantage of this in his treatment of fractured patella. From ten to twenty days after the injury he proceeds to operate. An incision being made over the patella, the anterior membrane and the unorganised coagulum lying beneath it are removed, but the posterior membrane is not interfered with, and thus the joint is not opened. The fragments are then united by platinum or silver wire suture, care being taken not to include the membrane of organised coagulum, but to let it fold upon itself posteriorly toward the joint cavity. Dr. Van der Meulen has operated in this manner in three cases of fractured patella, and has been enabled to obtain excellent and firm union. (*Deutsche Medicinal-Zeitung,* July 21, 1884).

Tricuspid Stenosis.—In reviewing the general facts of tricuspid stenosis *àpropos* of a case of his own, M. Chauffard points out that the only two signs in life we are likely to get of its presence are (1) the existence of extreme venous congestion in the neck without a venous pulse, and (2) presystolic and systolic murmur which culminates over the junction of the xiphoid cartilage with the sternum, and which is by this position and its harshness and superficiality to be distinguished from the murmur of mitral stenosis. With regard to the general conditions of

tricuspid stenosis M. Chauffard is in agreement with nearly all authors, viz., that it is almost always found in women, in forty-one cases out of forty-six (Fenwick), in adult life; and accompanied by other endocardial lesions, especially by mitral stenosis. In only half the cases does rheumatism seem to have been coexistent; it has been the result of a slow endocarditis, widespread and not vegetative, which has glued the bases of the valves together and made them contract. In only one case does it seem to have been congenital. (*Revue de Médecine*, July 1884.)

Abdominal Surgery in Germany.—The following cases of interest were brought forward at the last German Congress of Surgeons, and afford good indications of the progress which this branch of surgery displays in Germany.

(1) *Gastro-enterostomy for duodenal ulcer.*—The patient, who was twenty years old, had suffered from duodenal ulcer for four years. He was so reduced in strength that he only weighed fifty-one pounds. At one time he had vomited blood, but lately this had quite ceased, and he only suffered from vomiting of food. During the last few weeks, however, vomiting of blood had again appeared, and the bowels only acted after medicine. In these circumstances an operation was undertaken for the purpose of resecting the pylorus. When the stomach was exposed, it appeared that the narrowing was situated in the duodenum, and it seemed probable that prolonged treatment with the stomach-pump which had been attended with temporary success previously, might prevent the necessity of an operation which even if performed successfully might be the seat of an ulcer at a later period. For a while the use of the stomach-pump was attended with success, but the patient very shortly returned, brought almost to death's door by a slight error in diet. As soon as he had been got into a suitable condition the operation was again undertaken. By raising up the left side of the great omentum and transverse colon the duodenum was reached. Resection was performed and the edges brought together with a double row of stitches behind, and a treble row in front. The wound was closed and the patient made an uninterruptedly good recovery. On the tenth day the bowels were opened naturally, after which time there were two motions daily without medicine. The patient was exhibited at the Congress. (2) *Resection of the small intestine for cancer.*—A tumour had been observed some four weeks by the patient. It was situated just above Poupart's ligament on the left side, but could not be certainly made out to be connected with the intestine. But the rapid emaciation and digestive trouble pointed to the conclusion that this was probably the case. About eight inches of intestine were excised

by Dr. Schede together with a wedge-shaped piece of mesentery, which contained some enlarged glands. The whole wound healed without further trouble, and in about three months the patient had regained flesh. About six months later he was seized with symptoms of intestinal obstruction, and was brought into the hospital in an almost dying condition. An artificial anus was at once made in the site of the old incision, and after introducing the finger a constricting band was found and divided, which at once relieved the patient. He had seven actions of the bowels the same day, but did perfectly well for four days, when he developed an attack of pleuro-pneumonia from which he died. The post-mortem examination proved that the intestine had healed perfectly, and there was only a linear scar to show where the wound had been. (3) *Removal of the spleen for a cyst.*—The patient in question had his spleen removed in 1881, on account of a cyst about the size of a child's head. For the last two years he has followed his occupation as a mason. Immediately after the operation some changes were observable in the character of the blood, but these have since disappeared, and at the present time there is no enlargement of the thyroid or lymphatic glands. (4) *Removal of the spleen for sarcoma.*—A tumour of the spleen was displayed which had been removed a few months previously by Billroth. The patient was a woman aged forty-three who has been perfectly well since the operation. The patient had for ten years noticed an increased sense of resistance in the left hypochondriac region, which during the last two years had increased considerably and had become almost unbearable during the last few months, as it gave rise to intense dragging pains. A new growth in the spleen was diagnosed, and median laparotomy performed. The tumour was adherent behind to the tail of the pancreas, from which it was separated by the cautery. A portion of the pancreas came away attached to the tumour. The vein and artery were ligatured separately, and the rest of the gastro-splenic omentum in six pieces. After the operation the patient made an almost uninterruptedly good recovery, excepting only that she vomited a good deal for the first few days. For the first few weeks after the operation there was an increase to a slight extent in the white corpuscles; but there was no enlargement of the thyroid or lymphatic glands, or other troubles of any kind. (5) *A modified form of colotomy.*—Instead of performing the operation as it is usually done, Madelung cuts across the intestine completely and attaches the upper end to the opening in the side. By this means all the fæces pass at once by the side opening, and none can pass onwards to irritate the rectal cancer. The lower part of the colon, which is in connexion with the rectum, is closed at its upper end. The operation is of course not

applicable in those cases in which the intestine is very full of fæces at the time of operation. In all other cases it is to be preferred. Amongst other advantages it is said to prevent prolapse of the intestine.

Stretching the Intercostal Nerves.—Dr. L. von Lesser, of Leipzig, has recently reported a somewhat remarkable case of intercostal neuralgia and of mastodynia treated successfully by stretching of several intercostal nerves. The patient, a woman aged sixty-one years, and the mother of eight children, had suffered during seven years from a feeling of compression of the thorax, very severe paroxysms of darting pains along the intercostal spaces on both sides, but more intense on the right, and neuralgic attacks in the mammæ and nipples. Through the intensity of these paroxysms, which came on usually at night, she was prevented from sleeping, and her sufferings were so severe that she became very anxious that some operation should be performed which might give relief. Just below the ribs on the right side was a fatty tumour of the size of a plum; but this was soft and free from tenderness, and clearly not the cause of the neuralgia. On pressure over each of the much-atrophied mammary glands a few drops of fluid, resembling milk, could be forced out through the nipple. This fluid, which was secreted more abundantly during the paroxysms of neuralgia, presented under the microscope an abundance of oil-globules of different sizes, and a few round cells containing oil-globules. As the neuralgic pains were much more severe on the right than on the left side, the operation was performed on the right intercostal nerves from the fourth to the tenth. The incision was begun in the axillary line, and carried obliquely backwards and downwards from the upper margin of the third rib to the lower margin of the tenth rib. The processes of the serratus magnus muscle having been divided, and the external intercostal muscles separated from the lower margins of the corresponding upper ribs, the seven intercostal nerves were exposed, and each forcibly stretched in a centripetal and a centrifugal direction. The patient made a very speedy recovery. From the date of the operation she was able to sleep soundly at night, and complained only of occasional slight "dragging pains" on the right side of the chest and a feeling of compression over the lower intercostal spaces. Up to the time of her discharge, on the eleventh day after the date of operation, there had not been any return either of the paroxysms of pain or of the mastodynia. (*Deutsche med. Wochensch.*, No. 20, 1884.)

Hypodermic Injection of Amyl followed by Epileptiform Convulsions.—Dr. Sidney Ringer has noticed the

occasional action of the nitrite of amyl upon the heart, and the strange effect sometimes produced upon the nervous centres. He says: "I have seen one case where a woman immediately after a drop dose turned deadly pale, felt very giddy, and then became partially unconscious, remaining so for ten minutes." And again: "A delicate woman, after one-thirtieth of a drop, passed in a few moments into a trance-like state." In a case described by Dr. Strahan, a chronic maniac aged fifty-three had suffered for several days from severe lumbago; a ten-minim dose of a 10 per cent. solution of nitrite of amyl in rectified spirit was injected hypodermically. "Immediately after the injection the pain disappeared. He got up from the bed, and at my request stooped and touched the floor with his fingers. In, as nearly as could be guessed, about a minute and a half, he suddenly became deadly pale and sank back upon the bed." Then his face, head (bald), and neck became congested, and he was strongly convulsed for about half a minute. The convulsion affected the face and arms strongly, the legs slightly. The teeth were ground, and the breathing was suspended. In a few minutes, after coming out of this fit, he was attacked by a second one, during which the heart's action became very faint. He was made to inhale some chloroform, and the fits did not return. The lumbago entirely disappeared. This observation is interesting, as inhalations of nitrite of amyl have been recommended, both in this country and in Italy, to check the recurrence of epileptic convulsions. (*Journal of Mental Science*, July 1884.)

Polyuria in Convalescence from Typhoid Fever.—The attention of Dr. Spitz having been attracted by the case of a convalescent from typhoid fever, who passed from three to four quarts of urine a day, he was led to study the subject more closely. He found, to his great astonishment, that polyuria, sometimes to a remarkable degree, was present in about half the cases of convalescence from typhoid. The amount of urine excreted was usually greater as the fever itself had been more severe. The urine is of a light yellow colour, transparent, without sugar or albumen, and forming no special deposit. Its specific gravity varies inversely to the total amount excreted during the twenty-four hours. The polyuria begins at the period of greatest oscillations of temperature, and persists up to the fifth or sixth week of convalescence. It would seem to be of favourable prognostic import. (*L'Union Médicale*, July 6, 1884; *New York Med. Record.*)

External Massage in Stricture of the Urethra.—After recalling the difficulties which are encountered in the treatment of stricture where there is much swelling of the parts and thickening of the periurethral tissue, Dr. Géza v. Antal

describes some cases which he has treated successfully by rubbing and manipulating the urethra externally.

He recommends this method as specially applicable to chronically inflamed almost impassable strictures in which no instrument will pass, and the water only dribbles away by drops. The following example will serve to show how the operation is performed, and in what cases it is applicable. A man, forty-eight years old, applied for relief, as he could only pass his water in drops after much straining.

After being put to bed, and warm baths and poultices had been employed, no abatement of the symptoms had taken place, and there seemed nothing left but urethrotomy. In these circumstances, Dr. G. von Antal gently rubbed and manipulated the outside of the urethra in the perinæum for about ten minutes daily. On the third day the symptoms improved, and a small metal sound passed, and on the removal of this, a small flexible English catheter, and in seven days the stricture was dilated to No 14 English. The manipulation process was continued each day, as well as the passage of catheters. By the end of the week, the thickening had considerably abated, and the patient was in every way improved. It has of course yet to be determined whether these results are more lasting than those obtained by simple catheterism; but from the rapid absorption of the effusion round the urethra, it seems probable that they may be so. (*Centralblatt für Chirurgie*, p. 369, June 1884.)

Treatment of a Dermoid Cyst.—Dr. Baker reports the case of a hospital patient who was considered to be suffering from pelvic abscess. The aspirator-needle, carried up behind the uterus, gave a fluid-like pus; a free incision opened the peritoneal cavity, into which the air entered with a good deal of noise. The fluid proved to be not pus, but fat, and upon this circumstance was founded the diagnosis of dermoid cyst. An incision, about an inch long, was made into the cyst, and its edges united with those of a corresponding incision in Douglas's pouch. Injections into the cyst were repeatedly made; at one time a mass of hair presented and was removed, and later tissue containing teeth and bone came away. Knowing the difficulty of destroying the interior of these cysts, Dr. Baker passed a Sims' speculum *into* it, and applied the thermo-cautery to the whole surface. This was done four years ago, and the patient has remained well since, with no appearance of any return of the cyst. (*Boston Medical and Surgical Journal*, January 1884.)

Treatment of Sprain by the Elastic Bandage.—This method of treating sprains has recently been recommended by Marc Sée. It is the only method which fulfils the two indications: (1) To cause as rapid absorption as possible of the

blood extravasated around the joint (a lesion which controls all the other symptoms, such as pain, swelling, difficulty of movement, &c.); and, (2) to favour cicatrisation of the torn ligaments and ruptured parts by complete immobilisation.

The antiphlogistics and blood-letting formerly advised by Hunter and Guersant, only partially fulfil the former indication. There is the same objection to the movements which Ribe and Bonnet advise for the injured joint. The refrigerants and cold-water baths advised by Baudens cause contraction of the tissues around the joint, and dispel the inflammation, but they are not favourable to the absorption of the infiltrated fluids. Even massage, though superior to the other remedies just mentioned, fulfils only the second indication; furthermore, it is inconvenient, and requires much patience and time; and between the manipulations the swelling reappears and the pain returns. It is true that massage has the advantage of removing the extravasated materials from the region of the joint toward the more vascular portions of the limb, where they are more easily absorbed. But the elastic bandage has this advantage in a greater degree, since its action is continuous. Finally, and above all, it favours immobilisation of the joint, which is impossible during massage, and without which it is almost impossible to get cicatrisation of the torn structures and complete recovery in sprains of any intensity. The bandage should be applied to the skin itself, care being taken to fill up the flat and depressed places with wadding, so as to give a uniform surface around the joint for the bandage to act upon. (*Revue de Thérap.*, July 15, 1884.)

Extracts from British and Foreign Journals.

Cocain as a Local Anæsthetic.—Dr. Koller, of the Vienna General Hospital, has quite recently discovered in cocain a valuable agent for the production of local anæsthesia. He found that the introduction of from one to three drops of a two per cent. watery solution of cocain into the corneal chamber rendered both the conjunctiva and cornea completely insensitive, so that, for instance, the cornea could be partially gouged without exciting any reflex action or sense of pain. The same fact was demonstrated by Drs. Brettauer and Becker at the recent Ophthalmological Congress. Koller in his first report mentioned the employment of the same agent in the production of anæsthesia of the larynx. (*Lancet*, October 4, 1884.)

New Treatment of Gastric Ulcer.—The following is a summary of an interesting and novel method of treatment of chronic gastric ulcer introduced by M. Debove. It is founded on two principles: (1) That dilatation of the stomach by any means is injurious, and that contraction of its walls tends to aid the healing process; (2) That functional rest is very desirable, if not essential. On the first ground M. Debove objects to a purely milk diet as being too readily given in bulk, though he admits that experience has proved that this disadvantage may be successfully met. His own mode of procedure consists in (1) washing out the stomach with a specially contrived tube. This office should not be entrusted to the invalid himself, and requires the supervision of the medical attendant. M. Debove has not seen hæmorrhage result from this practice. He does not look upon the mere presence of "coffee-ground" material as proof of hæmorrhage, but would immediately stop in the event of the washings acquiring the rosy hue of recent bleeding. Care should be taken to avoid all rough handling. (2) Arrest of gastric digestion by the free admixture of alkalies with the food taken. The latter is given in the form of powdered meat, which is preferred as having small bulk. Three small meals per diem are allowed, the constituents being in each case powdered meat

25 grammes, sodium bicarbonate 10 grammes. Washings showed that the contents of the stomach never became acid, and that no peptone was formed in the stomach of the patients treated. No alkaline cachexia, such as has been described by Trousseau, followed. Indeed, from the rapid progress of the cases so treated, the alkali would seem to have had a specific healing influence on the ulcer itself. The work of digestion is thus entrusted to the liver, pancreas, and intestine. Two cases found intractable by other plans of treatment are quoted as resulting in recovery under this method. (*Progrès Médical*, July 12; *Soc. Médicale des Hôpitaux*, April 25, 1884.)

Kola.—M. Dujardin-Beaumetz recently exhibited several specimens of kola, the fruit of the Central African tree *Stercula Kola.* The negroes esteem the fruit very highly on account of its medicinal properties, which they consider to be tonic, nutritive, excitant, and aphrodisiac. They use it both fresh and in the form of infusion. Analyses show that kola contains a large amount of caffeine, and of tannin, with a little theobromine. It is therefore adapted to the treatment of tropical diarrhœa, of cardiac failure, and of many atonic states. Surgeons on shipboard have proved its efficacy in the first-named of these diseases. M. Dujardin-Beaumetz has employed this drug as an infusion (a cupful containing 15 grammes twice daily) in the form of liquid extract, or prepared like chocolate, with good effect in chronic diarrhœa and in cardiac affections. Kola, he concludes, is tonic and astringent, in virtue of its tannin and theobromine, and acts as a heart-stimulant mainly by means of its caffeine. (*Progrès Médical*, June 7, 1884.)

Treatment of Granular Eyelids.—A long memoir on this subject, which is the *bête noire* of ophthalmologists, has lately been contributed to the *Recueil d'Ophthalmologie* of M. Galezowski by Dr. Vouckchevitch, and this observer strongly recommends the excision of a flap from the conjunctival fold on the following grounds: that no specific remedy has yet been discovered for granular lids, that is to say, for true trachoma; that caustics, astringents, and antiseptics, are quite ineffectual in removing the granulation; that inoculation with blennorrhagic pus can only be employed in a few properly-selected cases, especially those in which pannus is present; that jequirity (the seed of the *Abrus precatorius*) has not as yet been sufficiently studied to enable any positive statement of its value to be made; and even if the two last-mentioned remedies are sometimes successful, it seems that they cure the complications of granular lids rather than the granulations themselves; that the abrasion of the granulations recommended by some authors, as by M. Heissrath, is not unlikely to cause troublesome malformations of the lids;

that most ophthalmic surgeons admit that the granulations are more numerous in the *culs de sac* than in other regions; that in consequence of their position, and of the anatomical relations of the eyelids to the globe, they are very difficult to attack by ordinary caustics; that excision of the *cul de sac* heals old granulations; and lastly, that their excision leaves no troublesome deformity of the eyelid, and is an operation that can be performed with ease. There cannot be a doubt, however, that much care should be exercised in regard to the size of the flap that is removed. It should not be too large, and the operation should not be undertaken till the usual and more simple methods of treatment have been fairly tried. (*Recueil d'Ophthalmologie*, Aug. 1884.)

Boroglyceride in Ringworm of the Scalp.—Dr. Shoemaker states that instead of following the old procedure, he generally has the affected spots sponged with a weak alcoholic solution of thymol, borax, naphthol, or corrosive chloride of mercury every day or two. To the surface thus cleansed, he immediately applies a 50 per cent. solution of boroglyceride until the entire scalp seems saturated with it. The borax he believes to be one of the most efficacious antiseptic and antiparasitic agents, having at the same time a mild astringent action, and thus tending to allay the irritation and soothe the parts. The glycerine at the same time penetrates and carries the substance into the follicles to the parasite. Glycerine has a great affinity for water and withdraws this from the tissues, thus depriving the fungus of one of its main elements of development. He cannot speak too highly of this simple application, from which alone he has observed rapid cures in some early cases of ringworm of the scalp. Boroglyceride solution is likewise devoid of any poisonous properties, and will be borne by even the most irritable scalp. This solution should be applied night and morning with a little sponge or mop, and must be well rubbed into follicles with the tips of the fingers. (*Journal of Cutaneous and Venereal Diseases*, No. 7, Vol. 2.)

Treatment of Diphtheria.—Recent numbers of the *New York Medical Journal*, and of the *Boston Medical Journal*, have contained several communications on this subject, chiefly with reference to the use of large doses of mercuric chloride, a method which appears to have originated with Dr. G. A. Linn, and which was afterwards so warmly endorsed by Dr. Wm. Pepper of Philadelphia, as to have become known as Pepper's treatment. Dr. Thallon points out that the drug has hitherto been used in two ways. (1) As a local application (spray or wash). (2) As a constitutional remedy. He is sceptical as to the value of local treatment, except that it has a soothing character. As regards

the second method, he points to Koch and Sternberg's experiments, which prove that the addition of one thirty-thousandth part of corrosive sublimate will arrest decomposition in bacterial fluid outside the body, while one twenty-thousandth will effectually sterilise it; and, having regard to the relative proportions of blood and body-weight in the individual, to the natural disease-resisting power of living tissue, to the fact that the elimination of the drug is slower than its absorption (Mayençon), and that it therefore possesses a cumulative action, and its value as an "aplastic antiphlogistic" (Robt. Hamilton), he asks whether it is entirely out of the way to suppose that during some period of the treatment by large doses of the perchloride there may be enough of the salt circulating in the blood—either free or in combination—to arrest, or at least to modify, the septic process? The doses should be large, frequently repeated, and *freely* diluted. He usually employs one or other of the following formulæ:—

(1) ℞ Hydrarg. Bichloridi, gr. ss;
Tinct. Ferri Chloridi, fl ʒ iij;
Glycerini, fl ℥ ss.,
Aq. ad ℥ iij.
M. Sig. fl ʒ j, as directed, in water.

(2) ℞ Hydrarg. Bichloridi, gr. ss;
Vin. Pepsin., Elixir Bismuthi, aa ℥ jss;
M. Sig. fl ʒ j, as directed, in water.

Each teaspoonful thus contains gr. $\frac{1}{40}$. The condition of the false membrane is the best guide as to increasing, continuing, diminishing or stopping the remedy. Several cases are given in which this treatment proved valuable; no toxic effects were observed. In the sloughing sore-throat of scarlatina a similar beneficial action was noted. Dr. A. Jacobi objects to the use of pilocarpine, believing that it sometimes hastens the fatal termination by inducing cardiac failure. In certain cases steam-inhalations are of great value, but care must be taken that the patient is allowed abundance of fresh air at the same time; he is also convinced of the utility of turpentine vapour (a tablespoonful of the rectified spirit or oil may be poured into water heated over a lamp or stove, every hour or oftener). The treatment by bichloride of mercury he has found very satisfactory as a rule; to infants half-a-grain (sometimes more) may be given in the twenty-four hours, and this quantity may be kept up for a considerable number of days; free dilution (one grain to a quart of water) serves to obviate salivation, stomatitis, and gastro-intestinal disturbance, but should these occur, inunction of the oleate of mercury may be substituted for the internal administration of the bichloride. Dr. J. L. Smith is impressed with the import-

ance of alcohol in the treatment of certain cases; he has often known a child one year old take with advantage as much as a teaspoonful of brandy or whisky every hour. Mercuric cyanide, favourably reported of by Dr. Erichsen of St. Petersburg, some years since, in doses of gr. $\frac{1}{96}$ to gr. $\frac{1}{48}$, has recently been again advocated by Seledén of Stockholm, who gives, every hour or half hour, one teaspoonful of a solution containing gr. $\frac{1}{10}$ to the ounce, which is also to be used as a gargle. Dr. G. A. Linn states that suffocation from obstruction of the air-way—of which there is danger when the diphtheritic membrane invades the larynx, causing croup—is mainly due to a spasmodic condition of the glottis, and can be relieved by giving chloride of gold, which is a specific in simple croup. It acts like a charm, is tasteless, and causes no nausea. It should be given dissolved in distilled water, the medicine being dropped into a glass, and the use of a spoon avoided. The dose for a child two years old is from one-fiftieth to one-thirtieth of a grain every hour until relieved. In diphtheritic croup it should be given in conjunction with bichloride of mercury. Of the latter salt, Dr. Linn gives one-twentieth to one-twelfth of a grain every three hours to a child two or three years old, and one-eighth of a grain to an adult. In mild cases it should be given thus to the end of the third day; in malignant cases for two or three days longer. (*Med. Times,* Sept. 20, 1884.)

Extractum Stigmatum Maidis in Diseases of the Heart. —During the past three years, Dupont (*Centralbl. für die gesammte Therapie*) has employed this extract in heart-diseases with very good results. The extractum stigmatum maidis reduces the action of the heart and increases diuresis. It is, as a rule, well tolerated. As a rule, its diuretic action is manifest on the first day after it is administered, and not unfrequently this action increases until after the third day. The amount of water excreted often increases from 500 grammes to 1,500 and 2,000 grammes (Oi-iv). It is especially indicated in diseases of the heart with œdema of the lower extremities, or general hydrops, in which class of cases it displays its power as a diuretic. As the œdema disappears, the blood-supply throughout the system is better regulated; the pulse-beat is more regular, the heart's action is slower and more rhythmical. While the general condition of the patient improves rapidly, dyspnœa does not seem to be influenced by the medicament. In cases of hypertrophy, contractions, and insufficiency, the same results were always noted. The reason why this drug deserves praise is because it is well tolerated by all the patients. When compared with digitalis it acts more rapidly, while there is not so much difference between its action and that of convallaria majalis.

In the beginning Dupont always administered the drug alone, until he had carefully studied its action, after which he combined with it bromide of potassium, iodide of potassium, and milk. With regard to the dose, the largest amount given was 3 grammes (45 grains), three times a day, one hour before each meal, with a little syrup. Generally half this quantity was sufficient to bring about a diuretic action. (*London Med. Record*, Aug. 1884.)

Functions of the Suprarenal Capsules.—Prof. Tizzoni has recently (*Gazz. degli Ospitali*, June 22, 1884) performed a number of experiments on rabbits, with the view of clearing up several points in regard to the office of the suprarenal capsules. The usual course was to evacuate the contents of the fibrous capsule of one or both sides. The parenchyma, in the form of a yellowish white pultaceous mass, either escaped into the peritoneal cavity or was altogether removed. Apart from a few exceptional instances of meningeal exudation and softening of the spinal cord, the animal did not appear to suffer in general health from the operation. There was as a rule little traumatic fever and suppuration. Nutrition was rarely impaired; and in fact, an increase of weight was generally noticed within eight days. The result did not appear to be at all influenced by allowing the parenchyma to remain in the cavity of the peritoneum, where it became absorbed. The interesting point is now to come. After the lapse of some time [length of time not precisely stated, probably as a rule under a month,—*Rep.*], a brown discoloration of the muzzle was observed. Later [probably within two months more,—*Rep.*] it extended to the cavity of the mouth and of the nose. It began in the form of small spots, which gradually increased and became blended. This discoloration, it should be noted, never occurred in white rabbits. When only one suprarenal capsule was removed, the pigmentation was exclusively or chiefly on the side operated upon. The altered distribution of pigment was the only effect of the operation, and the group of symptoms that constitute Addison's disease could not be produced experimentally. Touching the histological changes, regeneration was observed in two instances, in each of which the organ had in great part been destroyed. In one of these cases, 144 days after the operation a suprarenal capsule was found in all respects identical with a normal capsule. In the other case, twenty-six days after the operation a small nodule of newly formed tissue consisting of both cortical and medullary substance in process of active development was found. In the connective tissue that surrounded this nodule was a network of the sympathetic, with very fine meshes and large filaments provided with numerous large ganglion-cells. The enlargement

of the remaining capsule, when only one was removed, was at the expense of the cortical rather than of the medullary substance. (Reported by Dr. Haggard in the *London Med. Record,* Aug. 1884.)

Nature and Treatment of Pneumonia.—In the *Med. Times,* May 1884, p. 721, an abstract is given of a lecture by Dr. Burney Yeo on the Pathological Nature, Etiology, and Treatment of Pneumonia. In 1875 Klebs asserted that pneumonia was a parasitic disease, but Friedländer had the credit of first accurately distinguishing the organism and describing its specific form and characteristics. Dr. Yeo then goes on to show by a series of examples on what grounds the theory is based that pneumonia is an infective disease, dependent on the presence of a specific pathogenic organism in the body; and that, under certain somewhat rare circumstances of time, place, or season, it may spread by direct and indirect contagion. The most widely accepted view of the nature of pneumonia is that it is a typical local inflammation, produced by exposure to cold, and that the accompanying pyrexia is merely symptomatic of the local lesion. Another view which is maintained by many good authorities is, that acute pneumonia is a general disease, and that the lung inflammation is simply the chief local lesion. As regards the treatment of pneumonia, Dr. Yeo stated he was content to be what was called 'an opportunist.' He believed in no special treatment, but in a rational common-sense management of individual cases. The author concluded by stating that he considered the abortive treatment of acute croupous pneumonia by aconite to be highly dangerous, and that such a drug as aconite ought not to be "pushed" in pneumonia. (*London Med. Record,* Aug. 1881.)

Antipyrin in Children's Diseases.—As the result of numerous trials of this new anti-febrile substance on children at the Erlangen polyclinic, Professor Penzoldt arrives at the following conclusions:—(1) It is to be regarded as a very suitable means for diminishing the temperature in the febrile affections of children. (2) In proper doses it effects a diminution by several degrees during several hours. (3) The diminution of the pulse does not always correspond to that of the temperature. (4) Its influence upon the general condition of the patient is usually favourable. (5) Vomiting only sometimes attends its employment; but when this persists the antipyrin must be given in an enema. (6) The proper dose to begin with is as many decigrammes as the child is years old, repeated three times, at intervals of one hour. If this dose does not suffice for the production of a decided effect, then it must be increased decigramme by decigramme. In an enema we may give at a

single dose from three to six times as many decigrammes as the child has years. (7) After long use of it the child's system sometimes gets accustomed to the remedy. (*Berliner klinische Wochenschrift*, July 28, 1884.)

Treatment of Migraine.—In the *Brit. Med. Journal*, June 1884, p. 1144, Dr. J. K. Spender adds a few remarks to the treatment set down by Dr. Beale, in his book on *Slight Ailments*, of "sick headache." Dr. Spender speaks from personal experience, and says that he always felt particularly well on the day before an attack; this warned him, so that at bedtime he took a mild aperient of aloes and myrrh, and kept off sleep as much as possible, considering a long and deep slumber as most injurious. Starvation is a rule absolutely to be observed, but tea may be taken hot and strong at frequent intervals. With regard to medicines, Dr. Spender lays special stress on prophylactic treatment. A dose of Indian hemp and quinine, taken every night during the intervals of the attacks, gradually alleviates the disease. In several cases also, hyposulphite of sodium has seemed to do good. (*London Med. Record*, Aug. 1884.)

Early Use of Antimony in Surgical Cases.—Dr. H. Payne, in the *Brit. Med. Journal*, May 1884, p. 1041, writes that antimony is one of the drugs that has a similar action upon different persons suffering from different diseases, whatever may be their constitutional peculiarities. In antimony we have a drug, the physiological action of which produces just the opposite condition to that we have in the early stages of inflammation—viz., a diminution in the quantity of the blood sent to the part, and a retardation of its flow. Dr. Payne's theory is to treat a patient who has met with any injury or fracture, at the very outset, just as if he were already suffering from inflammation: by this means you often prevent the attack and hasten the recovery. By giving fifteen minims of antimonial wine every four hours, combined with ten minims of opium in some cases, one saves a great deal of risk from subsequent inflammation in cases of surgical injury. (*London Med. Record*, Aug. 1884.)

Typhoid Fever and Tuberculosis.—Dr. Gral denies the existence, advanced by some authors, of an antagonism between tuberculosis and typhoid fever. If typhoid fever, he says, attacks a tuberculous subject, it does not run an abnormal course, but the tuberculosis assumes an acute character in consequence. Typhoid fever may be a cause of tuberculosis by creating a predisposition in the patient to this disease. In the stage of convalescence especially, the tuberculous process often becomes very active. (*Deutsche Medicinal-Zeitung*, June 2, 1884.)

Acute Yellow Atrophy of the Liver.—This affection is so rare in children, that every case deserves to be carefully studied. Dr. Hyla Greves having met with a typical case in an infant of twenty months has taken the opportunity to pass in review the symptoms of the disease as seen in children, and to offer some general remarks on the nature of the affection. There is nothing in his case that calls for special notice; the child was ill for some days, and under observation before any symptoms of a serious nature made their appearance. The liver was at the commencement enlarged and not tender; later on, when it began to get smaller, it became very tender. Examination of the liver after hardening showed a marked increase in the connective tissue, especially around the portal vessels; a large number of free oil globules also were present between the cells. In many places all trace of liver structure had disappeared, and the small bile ducts appeared to be choked with epithelium which had undergone fatty degeneration. The course of the disease he divides into two stages: during the first of these there is gastric catarrh with enlargement of the liver; the symptoms in the later stage may be grouped under the head of nervous, including headache, drowsiness, rigors, convulsions, delirium and coma. Hæmorrhages from the mucous surfaces are common, the pulse and temperature often remain normal or subnormal until late in the disease, the liver decreases in size and becomes very tender, vomiting is almost constant and the urine is acid. the urea and phosphates being greatly diminished, and albumen, leucin, and tyrosin frequently present. As to the pathology of the disease the following are the considerations which he puts forward in support of the theory that it is a general disorder. The epithelium of all the glands in the body shows some parenchymatous degeneration, and the muscles of the heart and some of the voluntary muscles are in a similar state. The resemblance of the disease both to yellow fever and to phosphorus poisoning supports the idea of its being not a local disease. The almost absolute identity with some cases of icterus gravis suggests the notion of some general blood-poison, and the discovery of micro-organisms in the liver and in the blood during life points in the same direction. (*Liverpool Medico-Chirurgical Journal*, July 1884.)

Capillary Puncture of the Urinary Bladder.—Rosenberger advocates this mode of treatment wherever it seems desirable to submit the urethra to a rest-treatment, for instance, in case of stricture, hæmorrhage, prostatic affections, &c. In the case of strictures, even those which are permeable improve much more rapidly when they are subjected to this mode of treatment. In one case a capillary tube was passed twice

daily from the anus, and the bladder washed out through it, without any reactionary fever being set up. Contrasted with the old operation, in which a large and powerful trocar was employed, its results are greatly superior, and the death-rate, especially amongst older people, much diminished. (*Centralblatt für Chirurgie*, p. 376, June 1884.)

Treatment of Syphilitic Condylomata.—Salicylic acid and boracic acid are both very good remedies. Formerly, we often used to remove the larger warts of that kind with the scissors, and then cauterised the wound; but since we have employed the following powder, which is dusted three times a day over the new growths, we have never had occasion to have recourse to any other remedy:—

℞ Hydrarg. Subchloridi, gr. xxx.
Acid. Boracic. gr. xv.
Acid. Salicyl. gr. v. M.

Under the use of this powder the condylomata almost visibly dwindle away. (*Philadelphia Medical Reporter*, June 14, 1884.)

The Truss in Varicocele.—C. P. Clark, M.D., in "Notes of Practice" (*New York Med. Journal*), says books and teachers of surgery constantly, or customarily, warn us not to mistake a varicocele for a hernia, and aggravate it by the employment of a truss. Now the fact is, that the best of all treatment for this wearing and wearying affection is a weakish truss. It has never failed in my hands; and I have used it scores of times, not only entirely or greatly to relieve the sufferer, but by continued application, to effect a permanent cure, save in very aggravated cases. The theory of its operation is, that pressing upon the spermatic veins the pad takes the place of the deficient valves, supporting the superincumbent column of blood which their defection has let weigh down upon the sensitive parts below. This particular of practice is the more important, because the ailment is one that makes a man "feel bad all over," and argues to the mind of the patient, and not seldom of his surgeon, a variety of diseases that have no existence. When the bars of honour in our profession are still farther let down, and the "go as you please" principle becomes our law, I propose to advertise a list of the cases of Bright's disease, heart disease, dyspepsia, hypochondriasis—in fact almost everything but retroflexion of the womb and fissure of its os—that I have cured by the gentle pressure of a truss on the spermatic veins where they pass over the pubic bone. I was my own first case. (*Glasgow Medical Journal*, Sept. 1884).

Artificial Sea Air for the Sick-room.—Dr. B. Ward Richardson says that the solution to be used and diffused as a

spray consists of solution of peroxide of hydrogen (10 volumes strength), containing 1 per cent. of ozonic ether, iodine to saturation, and 2·5 per cent. of sea salt. The solution placed in a steam or hand-spray diffuser can be distributed in the finest spray in the sick-room at the rate of two fluid-ounces in a quarter of an hour. It communicates a pleasant sea odour, and is the best purifier of the air of the sick-room he has ever used. It is a powerful disinfectant as well as deodoriser, acting briskly on ozonised test solutions and papers. Mr. Carl R. Schomberg has recently invented a large spray-producer, which will diffuse the artificial sea air through a hospital ward. (*The Asclepiad*, July 1884.)

The Use and Abuse of the Obstetric Forceps.—Professor Goodell made the following observations in a recent clinical lecture:—"Tears of the perinæum will occur whether the physician uses the forceps or not, but in the majority of cases they come from the use of the forceps, or rather from the abuse of the forceps. Let me give a piece of advice to you as young men. When the proper time comes put on the forceps and boldly bring down the head, but when it begins to bulge the perinæum, take off the forceps. I do not think that any of you are competent to deliver the head over the perinæum with forceps. The temptation is to turn the head out too quickly. If you take off the forceps you will rarely have a bad tear, and if it does occur you will not get the blame for it. It is a very rare thing for me to end a labour with the forceps on. When the perinæum begins to bulge, I support the handles to see whether the pains are strong enough to end the labour. If so, I remove the forceps. There is such an abuse of this instrument that I sometimes think that Baudelocque was right when he said that the forceps had done more harm than good. It requires great skill and judgment to end a labour with the forceps. A physician from inexperience, or being demoralised by a long and tedious labour, is liable to use undue violence and deliver the head too quickly, or to make traction in the wrong direction. I have myself torn the perinæum and seen many good physicians do the same. From this experience I should recommend that, unless there be an excellent reason for contrary action, the forceps be taken off when the head reaches the perinæum. Occasionally one blade will catch over an ear and you cannot get it off: but in the majority of cases it can be removed, and that is the proper thing to do." (*Philadelphia Medical Reporter*, June 14th.)

Notes and Queries.

Calvert's Domestic Carbolic Vaporiser.—This little device deserves favourable notice for its simplicity and cheapness (it costs, with lights, eighteenpence), as well as for its efficiency. A night-light burning in a little vessel of water beneath a well-made tin capsule suffices to vaporise at a gentle heat carbolic powder or the liquid acid. In cases where a foul odour is given

off continuously, as in gangene, the continuous use of this little censer serves very well to purify and deodorise the air of the bed-room. It is further claimed that mosquitoes and other winged insects quickly leave a room where the vaporiser is at work. The amount of vapour diffused is not such as to interfere with comfort in breathing.

Southall's Sanitary Towel for Ladies.—We have pleasure in recommending this excellent little article. It is of

loose-woven elastic and very soft texture, highly absorbent, and purporting to be prepared with some antiseptic substance. Nurses and ladies speak highly of its comfort in the wearing, and its price (one penny, or twopence, according to the make) admits of its being burned after use. The drawbacks of the ordinary diaper used during menstruation, and still more in cases of uterine or vaginal discharge, are obvious, and become very great indeed to ladies who are travelling. The convenience and wholesomeness of this inexpensive sanitary towel are no less obvious.

LIQUOR CINCHONÆ (Paul).—We have received from Messrs. Savory and Moore a preparation bearing this name. It is stated to contain the whole of the medicinal constituents of the cinchona bark in their natural proportions, so that 1 fluid ounce of the liquor corresponds to 1 ounce of the finest bark, and contains 24 grains of alkaloid, chiefly quinine. We have not analysed this preparation, but we think Dr. Paul's name is sufficient guarantee for the amount of alkaloid. The liquor is very agreeable to take, and with some syrup of oranges will be relished by children, or with some effervescing water will form a pleasant tonic drink for adults.

SOLUTION OF MURIATE OF COCAINE.—We have received from Messrs. Allen and Hanburys a 4 per cent. solution of cocaine, the uses of which as a local anæsthetic are described at p. 455. In this country it has been used successfully to produce local anæsthesia in operations for squint, and by Mr. Butlin in operations on the interior of the nose.

Bibliography.

Some Important Points connected with the Surgery of the Urinary Organs. By Sir Henry Thompson, F.R C.S., M.B., etc. Students' edition, 8vo, pp. 147, with illustrations. 2*s.* 6*d.* London: Churchill. 1884.

The Use and Abuse of Pessaries. By G. Granville Bantock, M.D., F.R.C.S.E. Second edition, entirely rewritten. 8vo, pp. 173, with 19 illustrations. 18*s.* London: H. K. Lewis. 1884.

Medical Communications of the Massachusetts Medical Society. Vol. xiii., No. 3, 1884, 8vo, pp. 227 to 317. Boston: David Clapp and Son. 1884.

Lectures on Mental Disease. By W. H. O. Sankey, M.D., L.R.C.P., etc. Demy 8vo, pp. 454, with illustrations. Second edition. 12*s.* 6*d.* London: H. K. Lewis. 1884.

The Sanitation of Public Institutions; an Essay on the Experiences and Opinions of John Howard (Howard Prize Essay for 1883). By R. D. R. Sweeting, M.R.C S., etc. 8vo, pp. 96. 3*s.* 6*d.* London: Baillière. 1884.

Surgical Handicraft. By Walter Pye, F.R.C.S., etc. 8vo, pp. 544, with 208 woodcuts. London: Henry Kimpton. 1884.

A Handbook of Diseases of the Eye and their Treatment. By Henry R. Swanzy, A.M., M.B., etc. Small 8vo, pp. 437, with 123 illustrations, and Holmgren's coloured-wool tests. 10*s.* 6*d.* London: H. K. Lewis. 1884.

Fat and Blood: an Essay on the Treatment of certain forms of Neurasthenia and Hysteria. By S. Weir Mitchell, M.D., etc. Third Edition, revised with additions. Small 8vo, pp. 164. London and Philadelphia: Lippincott and Co. 1884.

Notes on Materia Medica and Pharmacy. By Frederick T. Roberts, M.D., B.Sc., F.R.C.P., etc. Fcp. 8vo, pp. 380. 7*s.* 6*d.* London: H. K. Lewis. 1884.

Department of Public Health.

THE RESULTS OF THE NOTIFICATION OF INFECTIOUS DISEASES.

EARLY in 1882 the Local Government Board, having been called upon to advise the Select Committee of the House of Commons on Police and Sanitary Regulations as to the best method for granting to sanitary authorities compulsory powers for the notification of infectious diseases, issued a Circular Letter to the several urban authorities who had acquired the powers under Local Acts, asking them, amongst other things, whether they had any suggestions to make on the subject, and how many cases of infectious disease had been reported up to the 25th of March of that year. The circular was addressed to twenty-three towns in England, and the answers which were received from these places, as also from Edinburgh and Greenock, were issued as a Parliamentary paper. The Select Committee, having considered the answers, reported that the experience which had been gained in towns where such special legislation was in force had been uniformly satisfactory; they noted that, quite apart from Local Acts, the Local Government Board, who are the department charged with the execution and supervision of the Public Health Act, had been parties to similar enactments in Provisional Order Bills, passed by their authority through Parliament; notably in the case of the Manchester Provisional Order Act, 1878; they approved of the terms of that Order in so far as it related to the compulsory notification of infectious diseases; they recommended that in any future amendment of the Public Health Act means should be devised either for extending similar powers to all urban sanitary authorities, or, at least, for clothing them with such powers on application; and they issued, as an Appendix to their Report, the terms of the

Manchester Order as typical of those which sanitary authorities might most usefully adopt. The following is a copy of that document, the importance of which is the greater because it may be taken for granted that it is intended to be regarded as a precedent for the Legislature in this matter, and that the Local Government Board will use their influence to secure the adoption of the principles laid down in it as regards future Local Acts or Provisional Orders dealing with the same subject.

"NOTIFICATION OF DISEASE.

"'Infectious disease' means and includes small-pox, cholera, typhus, typhoid, scarlet, relapsing, continued and puerperal fever, scarlatina and diphtheria, and such other disease as the Corporation under the provisions and for the purposes of this Act, may from time to time declare to be infectious.

"I. In order to secure that due notice be given to the Corporation of any inmate of any building used for human habitation who is suffering from any infectious disease the following provisions shall take effect (that is to say):—

"1. If any such inmate be suffering from any infectious disease the occupier or the person having the charge management or control of such building (or if such occupier or person be prevented by reason of such disease then the person in charge of such inmate) shall so soon as he shall become aware of the existence in any such inmate of any such disease forthwith give notice thereof to the Medical Officer of Health at his office;

"2. If such inmate be not a member of the family of such occupier or person the head of the family (resident in such building) to which such inmate belongs or if there be no such head or if such head be prevented by illness then such inmate (unless prevented by reason of such disease or of youth) shall on becoming aware of the existence in such inmate or in his own person as the case may be of such disease forthwith give notice thereof to such occupier or person;

"3. The Corporation shall provide and supply gratuitously

to every registered medical practitioner resident or practising in the Borough who shall apply for the same forms for the certificate or declaration to be made by such medical practitioner of the particulars hereinafter mentioned in relation to such cases according to the form set forth in the Second Schedule to this Act;

"4. Every medical practitioner attending on or called in to visit such inmate shall on becoming aware that such inmate is suffering from any infectious disease forthwith fill up sign and deliver or send to the Medical Officer of Health at his office a certificate or declaration stating according to the form so prescribed the name of such inmate the situation of such building the name of such occupier or person and the nature of the infectious disease from which in the opinion of such medical practitioner such inmate is suffering;

"5. The Corporation shall pay to every registered medical practitioner who shall in pursuance of this section duly make and give any such certificate or declaration a fee of two shillings and sixpence for each such certificate or declaration in respect of cases occurring in his private practice and a fee of one shilling for each such certificate or declaration in respect of cases occurring in his practice as a medical officer to any public body or institution;

"6. And any person who shall wilfully offend against this enactment shall for every such offence be liable to a penalty not exceeding forty shillings.

"II. The Corporation may from time to time by resolution on the report of the Medical Officer of Health and approved by the Local Government Board order that any infectious disease other than those specifically mentioned in this Act shall be deemed to be an infectious disease within and subject to the provisions of this Act.

"1. Any such order of the Corporation may be permanent or temporary only and if temporary the period during which it is to continue in force shall be

specified therein and the Corporation shall give public notice of the order by publishing the same by advertisement in two of the local newspapers circulating in the Borough and after such public notice has been given the provisions of this Act shall so long as the order continues in force apply to the disease specified therein in like manner in all respects as if the disease were an infectious disease specifically mentioned in this Act;

"2. The production of the newspapers containing a copy of the resolution shall be conclusive evidence that public notice of the order has been so given;

"3. The Corporation shall immediately after any such order shall have been made send a copy thereof to each registered medical practitioner residing in the Borough but the omission to send any such copy shall not affect the validity of such order."

Since that date there has been a further extension of the number of towns having compulsory powers of notification, and at the present time there are, apart from Scotch towns, thirty-seven places in England and Wales where such powers are in force. The following is a list of the towns in question, together with the dates when the Acts or Provisional Orders dealing with the subject were first granted:—

Locality.	Powers granted.	Locality.	Powers granted.
Accrington	1882	Jarrow	1878
Barrow-in-Furness	1881	Lancaster	1880
Birkenhead	1881	Leicester	1879
Blackburn	1879	Llandudno	1879
Blackpool	1879	Macclesfield	1882
Bolton	1877	Manchester	1881
Bradford (Yorkshire)	1881	Newcastle-upon-Tyne	1882
Burnley	1883	Norwich	1879
Burton-on-Trent	1878	Nottingham	1878
Bury (Lancashire)	1882	Oldham	1880
Chadderton	1882	Portsmouth	1883
Chester	1884	Preston	1880
Croydon	1884	Reading	1881
Derby	1879	Rotherham	1879
Dewsbury	1884	Salford	1882
Halifax	1882	Stafford	1880
Hartlepool	1883	Stalybridge	1881
Heywood	1883	Warrington	1879
Huddersfield	1876		

A considerable amount of evidence should by this time be available as to the working of these powers, and especially as to their influence in staying the spread of infectious diseases and of reducing the mortality which they occasion. But, unfortunately, a good deal of this evidence is not procurable. In many of the districts concerned no such reports are issued as are available for the purposes of reference, and in others the reports that are made public give but few details concerning the subject. There are, however, notable exceptions to this, and it will be useful to summarise the facts that are procurable. This we propose to do, referring to the several towns, as far as is practicable, in alphabetical order.

Accrington (Lancashire).—Population, 31,435 in 1881. Compulsory powers adopted in 1882. Notification to be both by medical practitioner and occupier. No reports available.

Barrow-in-Furness (Lancashire).—Population, 47,100 in 1881; area since enlarged, present population, 47,259. Compulsory powers adopted in 1881. Notification both by medical practitioner and occupier. Information limited to the annual report for 1883. In that report it is stated that 272 cases of dangerous infectious disease were reported. These comprised 216 enteric or continued fever, 51 scarlatina, 4 puerperal fever, and 1 small-pox. "Every house containing a patient was visited almost as soon as the case was reported; disinfectants were freely distributed, carbolic soap was supplied in the scarlatina cases, and the people were instructed as to the best means of preventing infection. Where it was considered necessary for the public safety that a case should be isolated, the new Infectious Disease Hospital supplied the means." Elsewhere it is stated that, as regards scarlet fever, the town had never been so lightly affected within the recollection of Mr. Settle, the medical officer of health, and he adds that "the compulsory notification of disease clause in our Local Act was no doubt of great service in limiting the spread of the disease." Thirty-one enteric fever patients, 1 case of measles, and 7 out of a total of 51 cases of scarlet fever reported, were received into the hospital.

Birkenhead (Cheshire).—Population, 84,006 in 1881; area of borough since extended, present population, 86,002. Compulsory powers adopted in 1881. Notification by medical practitioner,

and also by occupier, if no medical man in attendance. Mr. Vacher's annual report for 1882 gave the death-rate of the borough as 20·1 per thousand living. The number of cases of infectious diseases that had been notified under the new Act which had come into operation on the 1st of January of that year, was as follows:—Measles 615, scarlet fever 152, diphtheria 9, typhus 99, enteric fever 86, "fever" 25; making 987 in all. Of the whole number, 962 were notified by medical practitioners, and the remaining 25 by the school attendance officers, occupiers, the relieving officer, the inspectors of nuisances, and the registrars. Eighty-six patients were admitted into the Isolation Hospital, and the accommodation being restricted, these were mostly suffering from the same disease; 73 typhus patients having been thus isolated. Some complaint is made that, as regards typhus, the notifications were in certain cases received too late to be of any use, but a large amount of cleansing and disinfection followed on the receipt of the information. Speaking generally, however, Mr. Vacher says "the return of the number of notifications received shows that local practitioners have generally complied with the requirements of the Act." Certain cases of measles were not reported, and as these were cases in which no medical man had been called in, it was deemed expedient, by means of a printed notice, to draw the attention of the public to the fact that, acccording to Section 75 of the Birkenhead Corporation Act, 1881, the duty of notifying devolved on the occupier or person having the management of the building in question, "unless a duly-qualified medical practitioner has been called in." In connexion with the value of the compulsory system of notification, it may be mentioned that during 1882 the hospital belonging to the Corporation was more frequently made use of than in any year since 1877. The prevalence of such a disease as typhus may, however, be regarded as having influenced this result, apart from mere notification. According to the annual report for the year 1883, the death-rate for that year was 19·9 per thousand. Speaking of the notification of infectious diseases, Mr. Vacher enumerates the diseases to which the Act applies, viz., "small-pox, measles, scarlatina, diphtheria, fevers, and cholera"; he gives the cases reported as small-pox 3, measles 548, scarlatina 169, diphtheria

19, typhus 42, enteric fever 76, "fever" 17, or in all 874; and then he proceeds:—

"Of the whole number, 789 were notified by medical practitioners, 69 by school attendance officers who were informed by the occupiers, 6 by the occupiers, and 10 by the registrars. . . . . Comparing the number of cases reported in 1883 with the number of deaths, in respect of each disease, it will be seen that less than one in 13 of the known cases of measles died, less than one in 7 of the known cases of scarlatina, less than one in 9 of the known cases of diphtheria, and less than one in 5 of the known cases of fever. In 1882 less than one in 18 of the known cases of measles died, about one in 9 of the known cases of scarlatina, one in 3 of the known cases of diphtheria, and less than 1 to $4\frac{1}{2}$ of the known cases of fever. These figures are on the whole encouraging as regards the success, thus far, of Section 75. There is, however, no escaping the conclusion that a certain residuum of cases of infectious diseases still remains unreported."

The Report at another point says:—

"But little need be said with reference to the working of the 75th Clause of the Birkenhead Corporation Act, 1881, which came into force on January 1st, 1882. The return of the number of notifications received shows that local practitioners have generally complied with the requirements of the Act in this respect. Only eight cases of medical men neglecting to notify have come to the knowledge of the sanitary authority. In one case the practitioner was a new comer, and in all the other cases the practitioners had previously notified cases, and a reasonable explanation of the alleged neglect was given. It is true that the number of notifications received was less in 1883 than in 1882, but this is easily accounted for, as zymotic disease was less prevalent and less fatal in 1883. Relatively the number of notifications received was greater in 1883 than in the previous year, for while the zymotic death-rate of 1883 shows a reduction of 30 per cent. on that of 1882, the number of notifications in 1883 shows a reduction of 11 per cent. only.

"The allegation that compulsory notification in places where it exists has increased the mortality from diseases required to be notified, one would scarcely expect to find supported by facts. It certainly receives no support from the record of two years' results in Birkenhead. The mortality from diseases required to be notified during the first quarters of the four years 1878-81 averaged $38\frac{3}{4}$; the mortality from the same during the second quarter of these four years averaged 35; during the third quarter it averaged $23\frac{3}{4}$; and during the fourth quarter it averaged $48\frac{1}{4}$. The corresponding mortality during the four quarters of 1882 (*i.e.* after the compulsory notification clause was in force) was respectively 18, 17, 23, and 43; and during the four quarters of 1883 it was respectively 20, 19, 15, and 37. In brief the deaths from diseases required to be notified were 101 in 1882, 91 in 1883, and in the four years immediately preceding they averaged upwards of 145 a year. Yet the general death-rate was not exceptionally low in 1882 and 1883, being 20·11 and 19·95; in the four preceding years it averaged 19·84. How is it possible to resist the conclusion that compulsory notification was to some extent instrumental in lowering the mortality from the diseases required to be notified?"

During the year, 70 cases had been admitted to the hospital belonging to the sanitary authority, the mean annual number

of admissions in the two years during which compulsory notification had been in operation being 78, as opposed to 40 in the four preceding years; a new hospital pavilion affording increased accommodation had been provided, and the desirability of securing still further means of isolation was under discussion. There had also been a marked increase in the amount of cleansing and disinfection on the discovery of infectious diseases. Thus, taking the year 1881 previous to the passing of the Local Act and the two subsequent years, the following is the result:

	1881.	1882.	1883.
Houses or parts of houses disinfected	110	294	795
Notices to whitewash and cleanse complied with	130	160	166
Parcels of infected bedding and things, disinfected	122	135	139
Parcels of ditto, destroyed	26	6	19
Total	388	595	1,119

Blackburn (Lancashire).—Population 104,014 in 1881. Compulsory powers adopted in 1879. Notification to be given by medical practitioner, and by occupier if no medical man in attendance. The information contained in the later annual reports is very meagre, in so far as the operation of the compulsory notification of infectious diseases is concerned. The report for 1882 gives the annual death-rate per thousand living as 22·7, and a table shows the distribution as regards streets of 210 cases of typhoid, 331 cases of scarlatina, and 4 of small-pox, which were reported. The report for 1883 is nearly as meagre. During that year the general death-rate had risen to 23·8 per thousand; a table is given showing the localities in which 442 cases of typhoid and 275 cases of scarlatina occurred; and a reference to a small-pox hospital seems to imply that the sanitary authority have not made provision for the proper isolation of those infectious fevers against the spread of which no other means, such as vaccination, are available. There is, however, a good deal of disinfection, and some destruction, of infected articles in progress, and the "zymotic" death-rate is shown during the years 1880, 1881, 1882, and 1883, to have been 4·9, 2·4, 4·1, and 2·5 per thousand respectively.

In answer to the Circular Letter of the Local Government Board of 1882, the town clerk of Blackburn stated that the immediate notification of infectious disease had been the means of preventing the spread of small-pox during the previous year.

"Each case as it was notified to the authority was immediately and as effectually as possible isolated, and every known means adopted to prevent the spread of infection, and in some cases nursed day and night at their own houses by corporate officials. And on the speedy erection of a special hospital every case was removed to it and strict isolation enforced. In no single case did a second one arise in the dwellings of those whose infectious disease had been previously reported and the patient removed to the hospital, and no other case in the borough could be traced to these. Had the provisions for the notification of infectious disease not been in operation, it is probable that early and proper isolation could not have been efficiently carried out, and each case would have formed a centre of infection."

Blackpool (Lancashire).—Population 14,229 in 1881. Compulsory powers adopted in 1879. Notification required both from medical practitioner and from occupier. It appears that only the two last annual reports for this district were printed. The one for 1882 gives no special information as to the working of the Local Act. The death-rate is given as 21 per thousand, and amongst the deaths registered were 17 from measles, 7 from "fever," 6 from scarlatina, and 2 from diphtheria. The report for 1883 is but little better than its predecessor in regard of information as to the notification clauses. The general death-rate was 19·5 per thousand; the cases notified were 94 in number; namely, 44 from scarlatina, 23 from enteric fever, 16 from measles, 8 from diphtheria, and 3 from small pox. The deaths included 6 scarlet fever, 5 fever, 3 diphtheria, and 1 each from measles and small-pox The notification is regarded as having led to a considerable increase in such sanitary work as cleansing and disinfection, but isolation was hindered for lack of a proper hospital. On this latter point we find from Dr. Thorne Thorne's report of 1881 to the Local Government Board on "The Use and Influence of Hospitals for Infectious Diseases," that in 1880, whereas the deaths included 22 from scarlet fever, 12 from "fever," and 1 from diphtheria, only 7 cases had been removed to the Isolation Hospital, namely 4 who were suffering from scarlet fever and 3 from "fever." The report then proceeds as follows:

"Under Section 75 of the Blackpool Improvement Act, 1879, ... the Corporation acquired powers for the compulsory notification of infectious diseases. In 1880 the number of cases reported under the Act included 66 of scarlet fever and 43 of 'fever,' but up to the date of my visit in May 1881, this notification, although it had led to a considerable increase of such sanitary work as the cleansing and disinfection of infected houses, had not resulted in any increased isolation of infectious diseases in hospital. On inquiring as to the causes of this, I found that they were several. In the first place the position of the hospital with regard to the cemetery had from the first hindered its proper use, and this cause still remains in operation. Secondly, the nature of the accommodation provided, limited as it is to the reception, in public wards only, of cases of one disease in both sexes, is known to be a reason why many medical practitioners feel themselves unable to recommend its use to their patients, whether visitors or residents. In the third place, paupers from the borough have been admitted since the beginning of 1879, and although only one or two such patients have as yet been received, this is also known seriously to affect the use of the hospital; indeed before the admission of paupers had been sanctioned, it was found much more easy than now to secure the isolation of visitors. Referring to the hospital in his annual report for 1879, Dr. Leslie Jones, medical officer of health for the borough, says :—'The medical men in the town appear to be unwilling to transfer their patients to the sanatorium, and the resident public, probably from its situation in close proximity to the cemetery, have a great aversion to avail themselves of it. The sanatorium contains but two wards, male and female, and is consequently unfitted for the reception of various contagious diseases' at one and the same time. 'Practically the sanatorium, as a hospital for infectious diseases, is useless.' Again, in a special report in 1880, Dr. Leslie Jones writes: 'Had we a suitable institution for the reception of fever cases of different types, I do not doubt that the aversion which at present exists to the sanatorium both among the public and the profession would be removed, and the most important of all means of checking disease would be at our disposal.'"

This same hospital, so specially unsuitable to the requirements of a sea-side resort, still remains the only means of isolation available, and so long as this is the case one of the principal advantages which may be expected to accrue from compulsory powers of notification must remain all but in abeyance.

Bolton (Lancashire).—Population 105,414 in 1881. Compulsory powers adopted in 1877. Notification required from both medical practitioner in attendance and from occupier.

Writing in 1878, Mr. Ed. Sargeant, the borough medical officer of health, reported that 1,939 cases of infectious disease had been notified; he expressed the opinion that the system had largely contributed towards diminishing the number of deaths from fever and small-pox, although the zymotic rate for the year had not been "markedly affected by the provision." The information had succeeded in bringing to light unhealthy conditions

in houses which might otherwise have existed until further disease, or even death, had resulted. In many cases the spread of disease was believed to have been limited by processes of cleansing and disinfection; the knowledge acquired had been useful in preventing the attendance, at school, of children from infected houses, and it provided "the groundwork of a system of sanitation." A disinfecting stove and a mortuary had been erected, certain public washing arrangements were in progress of completion, and Mr. Sargeant pressed his authority to add to these the erection of a suitable hospital for infectious diseases, which the town still lacked. In the 1879 report credit is taken for preventing the spread of infection by clothes and otherwise to mills, schools, and other public buildings. It was, however, not until 1883 that proper hospital provision was made, and hence it becomes interesting to note what was the influence of the system of notification of infectious diseases upon the borough during the six years in which it had been in operation, in the absence of one of the most essential conditions for preventing the spread of infection, namely, means for the immediate isolation of the first attacks of infectious diseases heard of. The following table supplies some of the data necessary to form an opinion, although in some respects it is imperfect.

Date.	Estimated population.	General death-rate per 1,000 living.	Deaths from seven principal zymotic diseases.		Number of infectious cases notified.	Cases of scarlet fever notified.
			Rate per 1,000 living.	Percentage to total deaths.		
1867-76	?	25·9	?	20·2	—	—
1877	95,000	23·5	4·3	18·7	—	—
1878	105,000	22·0	4·7	21·5	498	144
1879	105,000	21·2	2·5	11·8	651	404
1880	106,700	20·6	4·5	24·4	1,646	702
1881	105,414	19·2	2·5	13·3	469	320
1882	106,767	21·3	5·2	19·4	655	259
1883	107,862	19·9	2·1	10·4	207	103

Thus, comparison between the different years is interfered with to some extent by the fact that during the term to which the statistics relate, the section of the Bolton Improvement Act dealing with notification was amended and modified under

a Provisional Order. A decided diminution has taken place in the general death-rate since 1876, but it must be remembered that it had set in before the influence of compulsory notification came into operation, and that considerable improvements in the sanitary circumstances of the borough have been for many years continuously in operation. As regards scarlet fever, the most fatal of our infectious fevers, it is difficult to see that, in the absence of means of isolation, any very material good was done. This seems pretty clear from the number of cases of that disease notified, but it is even more noticeable when the deaths for a long series of years are put together. The scarlet fever deaths in Bolton during the period 1869—1883 have been as under :—

Date.	Deaths from scarlet fever.	Date.	Deaths from scarlet fever.	Date.	Deaths from scarlet fever.
1869	35	1874	176	1879	45
1870	79	1875	38	1880	112*
1871	172	1876	41	1881	31
1872	96	1877	106	1882	21
1873	136	1878	144	1883	6

* Fifteen months.

The general tendency of this table is to show that scarlet fever has recurred as a serious epidemic every few years quite irrespective of the system of notification : the diminution during the past two years has, however, been more marked than in any previous period, but it yet remains to be seen how far this will be maintained, and how far the system of notification, now that it is supplemented by adequate means of isolation, will be efficient to control the disease. On the relation of these two measures of prevention to each other Mr. Sargeant's annual report for 1883 says: "The size of hospital accommodation is influenced by notification, for when the latter is carried out efficiently, a small hospital, which may be sustained at little cost, is sufficient for isolating the serious cases of infectious disease which from time to time occur; but if, on the other hand, these first cases, owing to their existence being unknown, are not stamped out, an epidemic is probably the result, and the largest hospital may be found inadequate to meet its demands."

(*To be continued.*)